

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A 43414990
Version B

GROUP: Q

72

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
C
~~a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed~~
~~b. Melting of permafrost resulting in more methane escaping into the atmosphere~~
c. An increase in evaporation and cloud formation resulting in the release of latent heat
d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
B
a. The magma becoming colder
b. Gas bubbles forming in the magma
c. The surrounding crust becoming hotter
d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
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a. A= erosion, B= deposition, C= uplift and erosion
b. A= erosion, B= biochemical precipitation, C= uplift and deposition
c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
d. A= dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
C
a. Human activities are the primary cause of the greenhouse effect.
b. Natural processes are the primary cause of the greenhouse effect.
c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
d. Neither human activities nor natural processes are important causes of the greenhouse effect.
e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
B
a. Reservoir A has a shorter residence time than Reservoir B.
b. Reservoir B has a shorter residence time than Reservoir A.
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6. Which of the following would cause the acidity of Earth's oceans to decrease?
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a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
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2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- B
- a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- C
- a. ~~Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Process: If there is an increase in the amount of carbon dioxide in the atmosphere there has to be an increase in the amount of carbon in the ocean because these two are in equilibrium. Also, when carbon increases in one reservoir it has to increase in another, because if more carbon is flowing into one reservoir more carbon is leaving that reservoir & flowing into the other.

Positive Feedback: The positive feedback loop is that if there's more carbon in the atmosphere more carbon flows into the ocean. Basically, there just keeps getting more & more carbon in the cycle.

Negative Feedback: A negative feedback loop is that because there is more carbon in the atmosphere, the residence times become longer, which may mean that the carbon spends more time in the atmosphere slowing down the time of ocean acidification.

no rate
A

20

2

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

unclear

Energy comes to the Earth as visible light from the Sun. This visible light is then absorbed & re-emitted to space as infrared. The greenhouse? then absorbs & re-emits the infrared. This "trapped" energy heats the Earth. When volcanism on Earth suddenly increases dramatically & there's more ash clouds in the atmosphere, the visible light coming down from the Sun is blocked. When the visible light is blocked, the Earth doesn't absorb anything & can't re-emit infrared causing temperatures to decrease, because there is no more "trapped" energy anymore. If the volcanism decreases & the ash settles out though, the temperature would rise dramatically because of all the CO_2 added from the past on. Because the CO_2 still has a constant rate.

22

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Different
Evaporation: liquid water turning into water vapor
Degassing: water vapor turning into liquid

Earn up to 1 additional point on your course grade

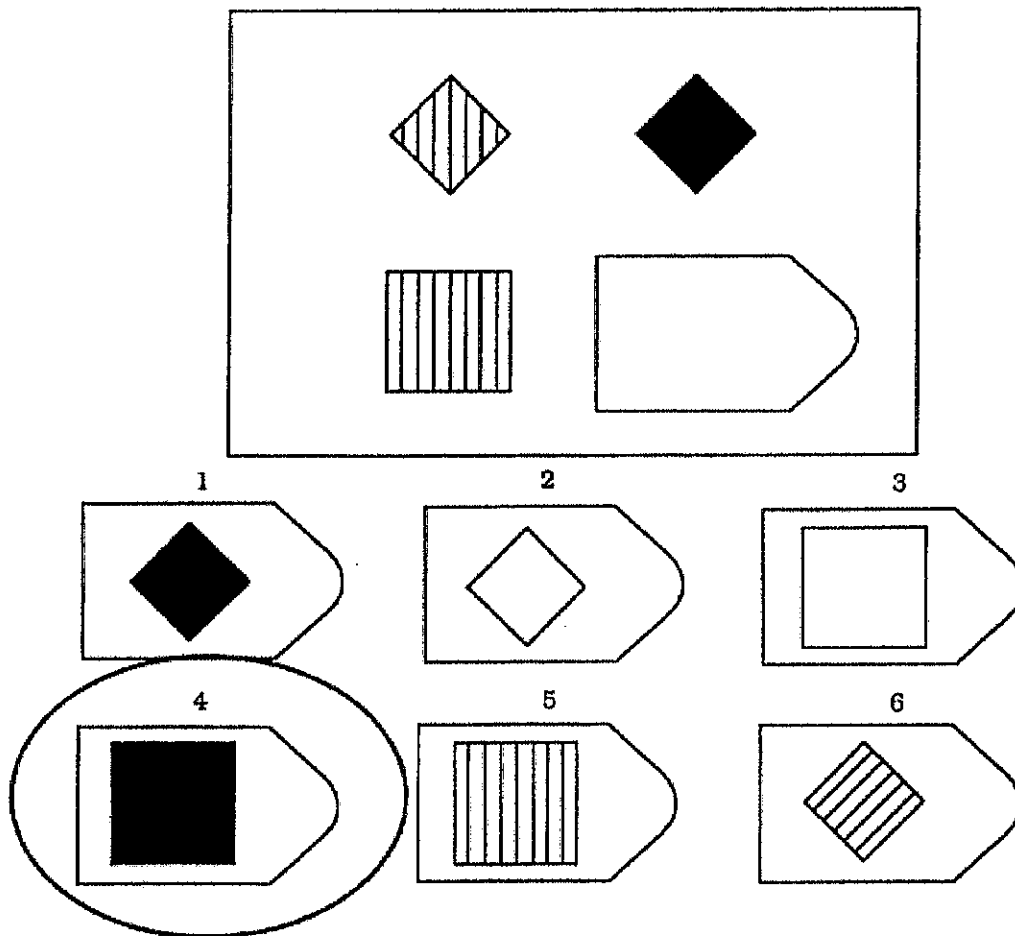
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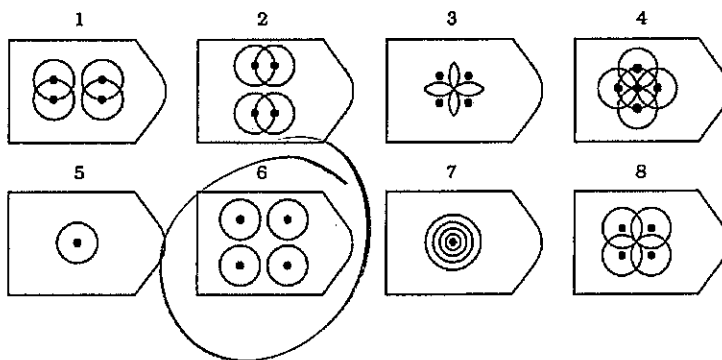
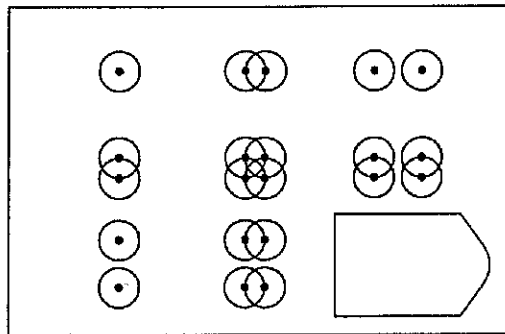


Answer: 4

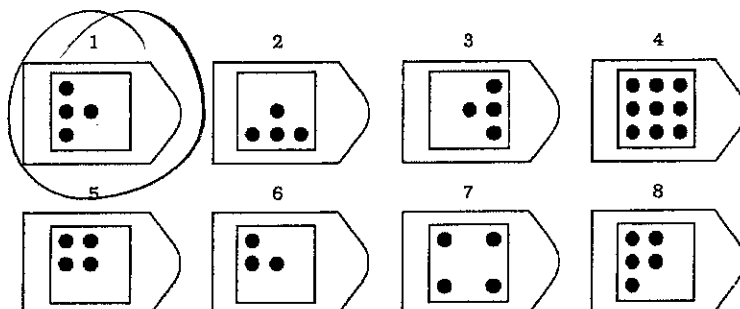
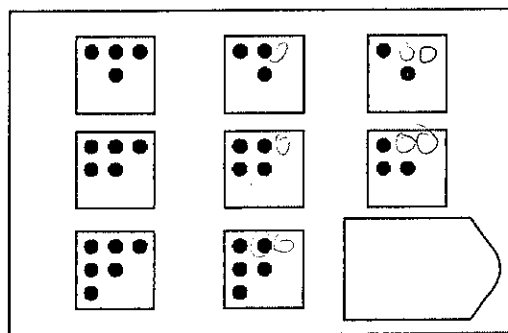
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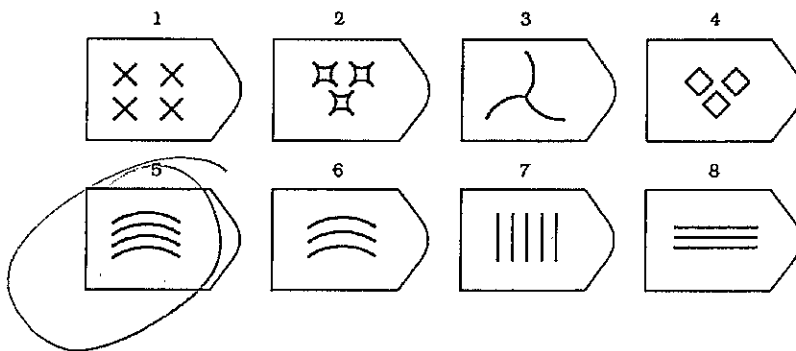
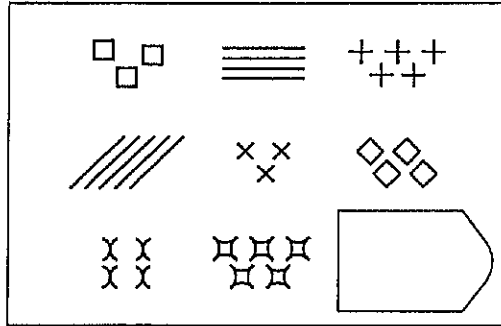
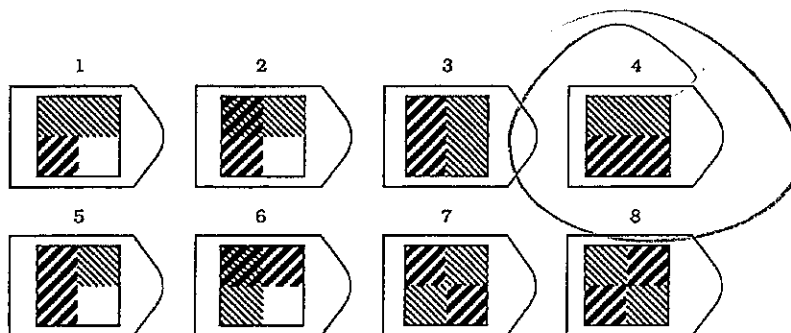
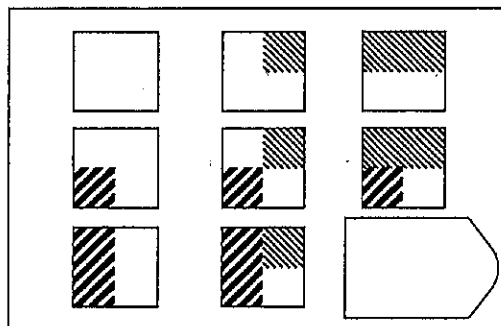
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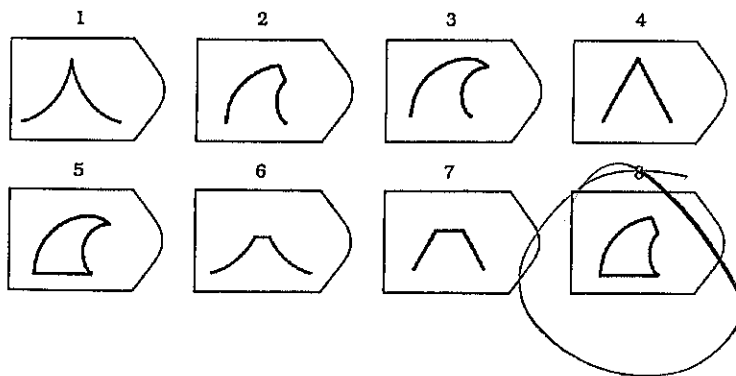
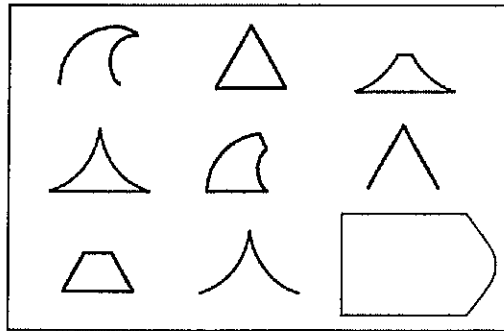
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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Please choose the best analogy to each of the following statements.

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Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

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- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 49341

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

SCA CAL
WCAV

1

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

STUDENT NAME: A43143118

GROUP: Q

Version B

74

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$$2 + 2 = 4$$
$$1 + 1 = 2$$

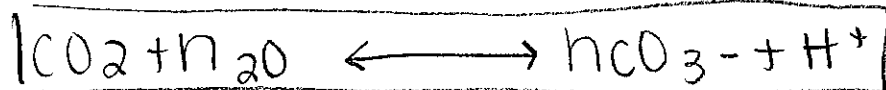
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- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Carbon levels
The acidification of the ocean and atmosphere are directly connected. An increase/decrease in 1 causes an increase/decrease in the other. More carbon present = higher level of acidity.



when carbon dioxide + water are added together, they react to form hydrogen + bicarbonate.

ocean acidification is like a reservoir. If there is an increased amount of carbon present, the residence time of carbon in the carbon cycle will increase overall.

positive feedback - when there is more carbon in the atmosphere there becomes more carbon in the oceans, meaning it is more acidic. This is causing a further change in the same direction.

negative feedback - the basis of the carbon cycle in general is to maintain equilibrium in the cycle. Because there is now more carbon in the cycle (flowing in) the amount flowing out of the cycle will increase at the same time in order to maintain equilibrium, bringing the cycle back to balance.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

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- Clear connections between events and changes in atmospheric temperature.

1) greenhouse effect occurs when the sun emits heat that is mostly visible light when it reaches the earth. The earth reflects a small amount of this and it is lost in the atmosphere. The earth absorbs the visible light and re-emits it as infra red light. Greenhouse gases in the atmosphere absorb the infra red and re-emit it back to the earth. This cycle traps heat between the greenhouse gases + the earth.

→ when there is ash emitted into the atmosphere the sun rays will be blocked.

2) the earth's atmospheric temperature will increase when ash is blocking the light from the sun. Because the visible light from the sun cannot be absorbed by the earth the greenhouse effect cannot take place, thus the heat that is trapped in the atmosphere will no longer be there → atmospheric temperature will go down.

24

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Both go thru a phase changing requiring energy and releasing heat.

Earn up to 1 additional point on your course grade

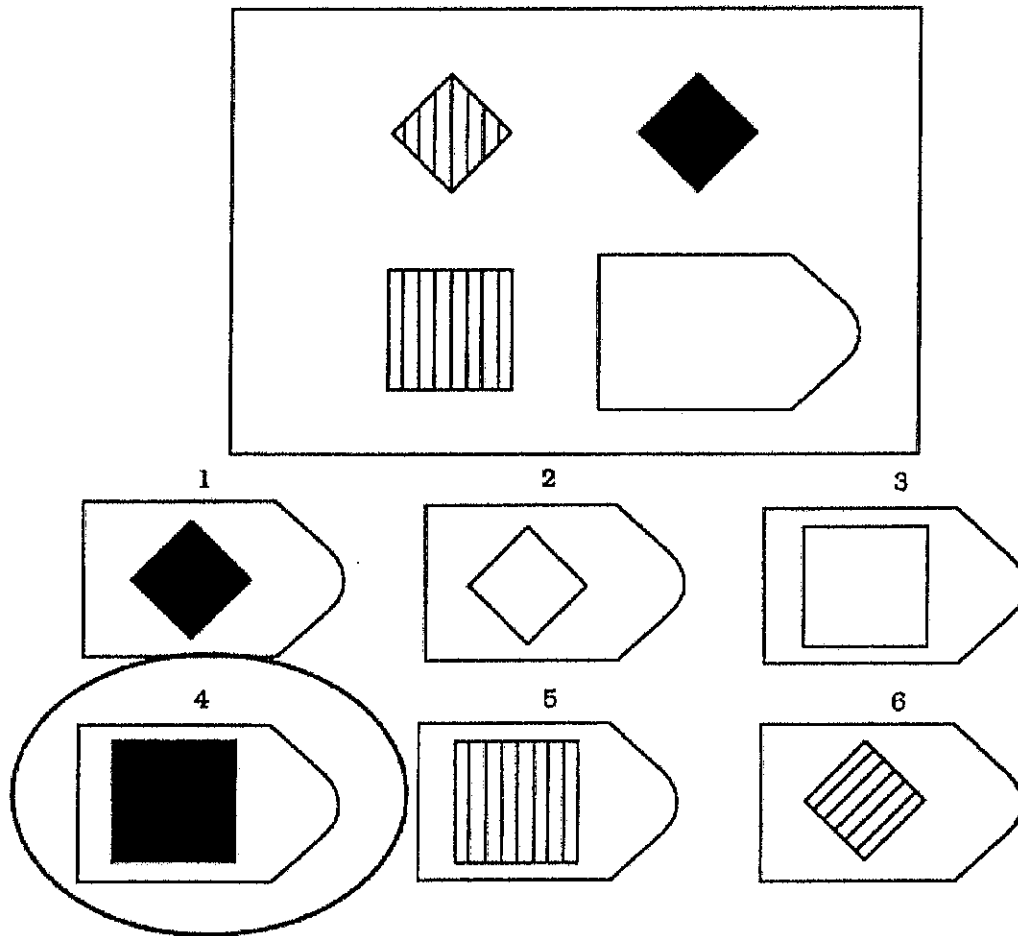
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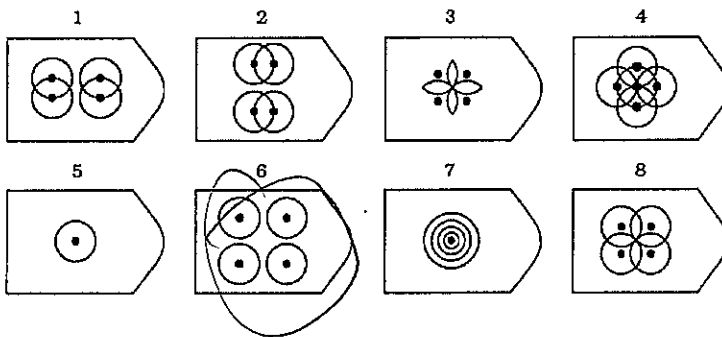
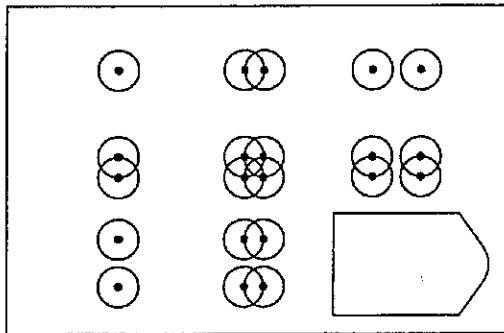


Answer: 4

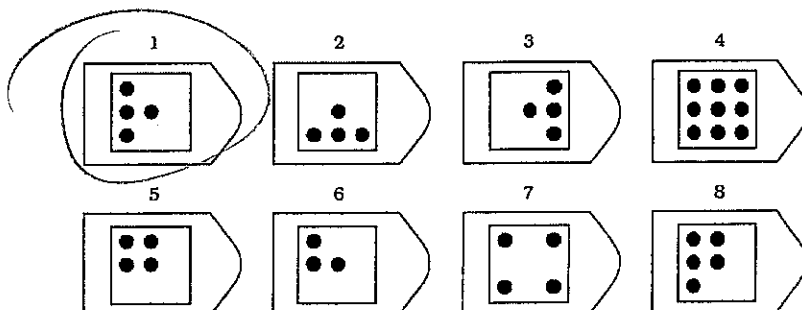
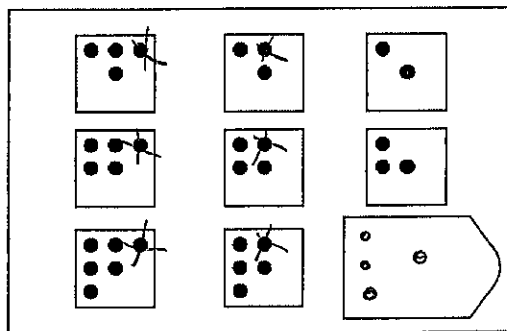
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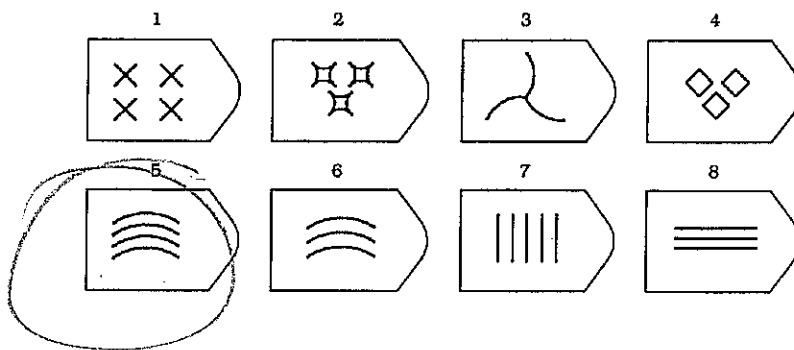
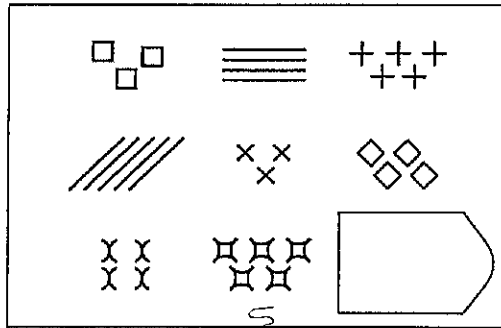
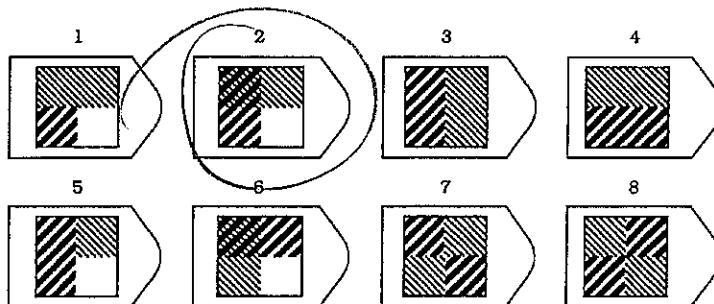
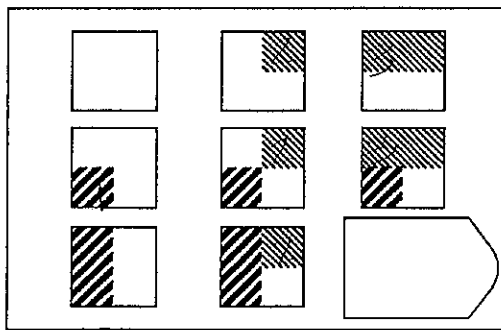
PATTERN 1

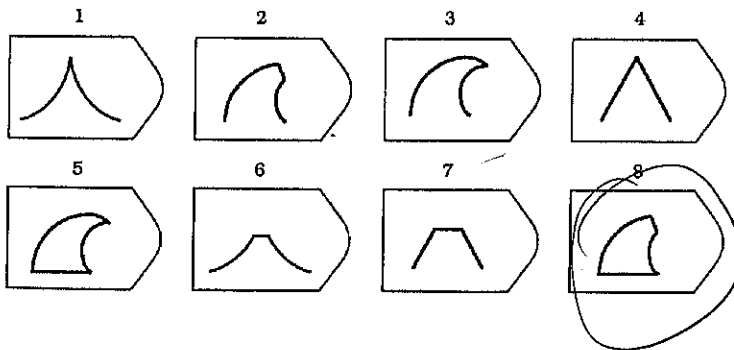
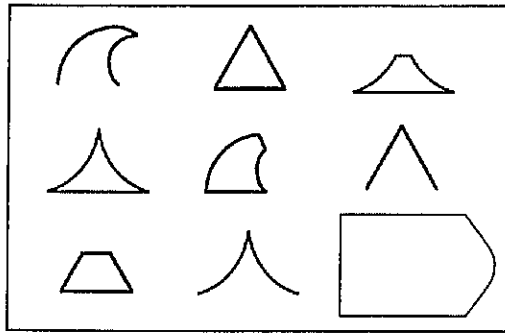


PATTERN 2



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- ☒ C. Being sleep deprived. They both involve impaired functions.
- ☐ D. Eating too much candy. They both involve lack of self-control.
- ☐ E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☐ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☐ C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48642

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

STUDENT NAME: A43628397
Version B

GROUP: Q

85

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?

- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- ☒ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ☐ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
☒ d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☐ a. Human activities are the primary cause of the greenhouse effect.
☐ b. Natural processes are the primary cause of the greenhouse effect.
☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☒ e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A. $A = \frac{200}{50} = 4$ $B = \frac{100}{50} = 2$ $\frac{\text{time}}{\text{in/out}}$
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.

6. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.


☒ 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- B
- a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
 - ~~d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease~~

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

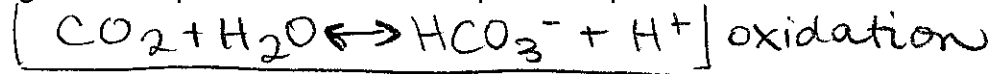
- B
- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ~~c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.~~
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- 

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.



a. If the CO_2 in the atmosphere increases, so will the CO_2 in the oceans because they are in equilibrium. Ocean acidification occurs when the CO_2 in water combine together to form acid and oxygen. So more CO_2 in the oceans would cause the pH of the oceans to increase (positive feedback).

b. However, a CO_2 increase in the atmosphere will increase the temperature of the atmosphere. Thus, also increasing the temp. of oceans. Warmer water cannot absorb as much CO_2 so that would lower pH (negative feedback). Ultimately pH would increase because of the increase in atmospheric carbon dioxide.

25

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

25

a) greenhouse effect: Energy enters the Earth as visible light. Some of it is absorbed by the Earth's surface and some is not. (What's not absorbed goes back into space and is lost) What is absorbed, is re-emitted as infrared light. This IR encounters greenhouse gases. What doesn't encounter gg is lost to space. What is, is absorbed and re-emitted as infrared. That is again absorbed by Earth's surface and re-emitted. (Some is not absorbed and is also lost to space. This process continues back and forth. This "trapped" energy is what heats the earth.

b. connections: The increase in volcanism will drastically increase the amount of ash in the atmosphere. The ash hinders the visible light from the sun from entering the atmosphere. While greenhouse gases continue to increase, there is no visible light able to bring energy in to the atmosphere so the Earth's atmospheric temperature will decrease.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

X They are similar because they both involve liquid molecules becoming gas molecules.

Earn up to 1 additional point on your course grade

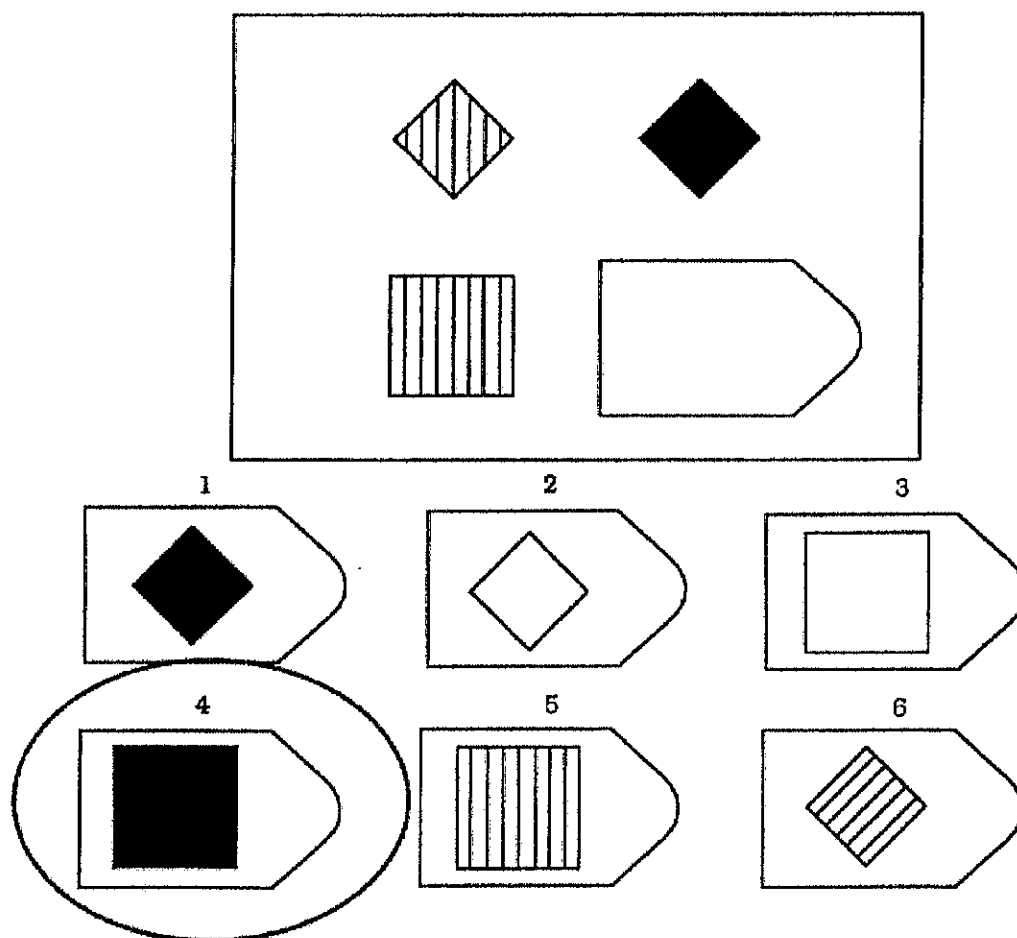
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

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Example

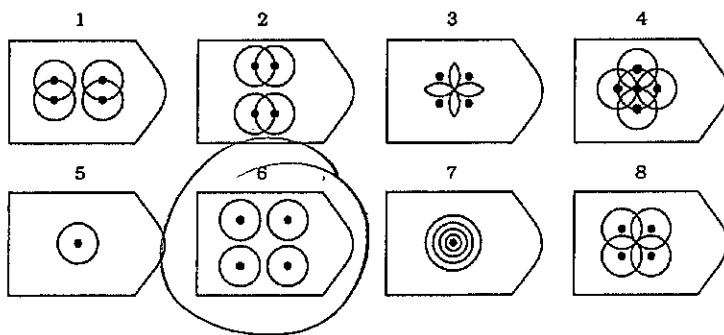
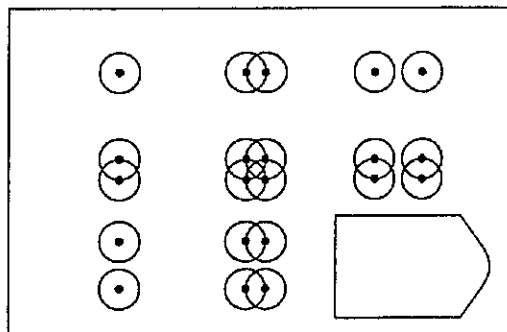


Answer: 4

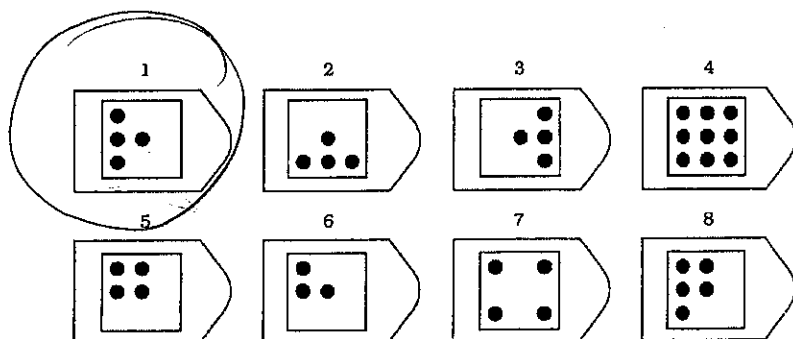
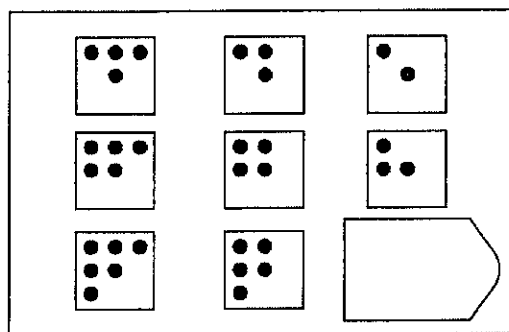
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

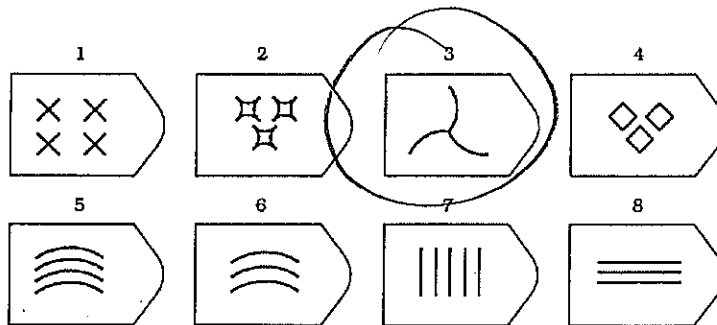
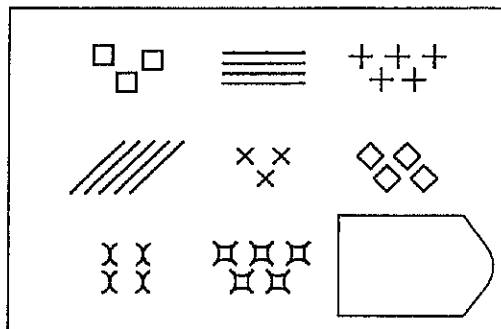
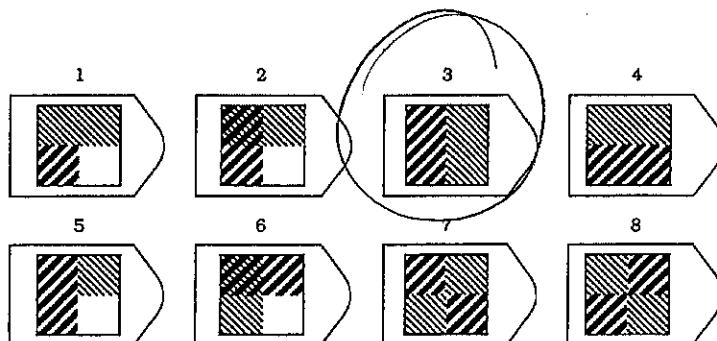
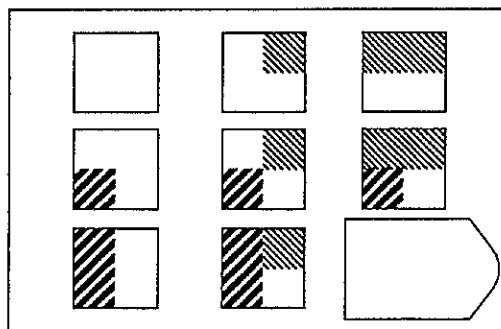
PATTERN 1

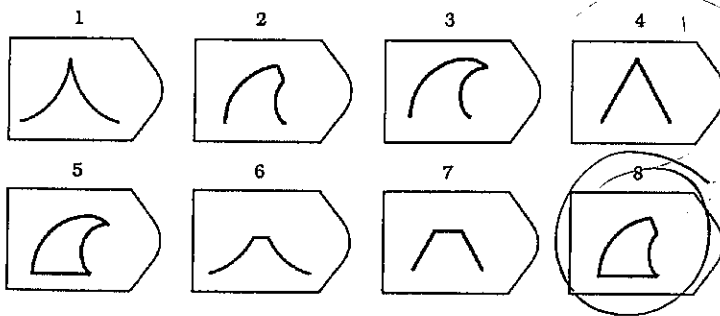
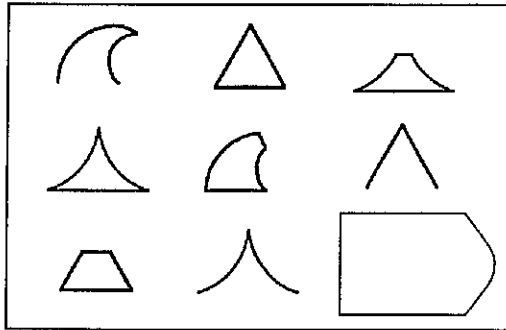


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

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D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

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D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48316

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A4336/981

GROUP: Q

Version B

MULTIPLE-CHOICE. 5 points each (50 points total).

1/ Which of the following would be considered a negative feedback to increasing global temperature?

- A
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- B
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- C
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition

4/ Which of the following statements about the greenhouse effect on Earth is most accurate?

- A
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- B
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
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6. Which of the following would cause the acidity of Earth's oceans to decrease?

- A
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- B
- a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- D
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

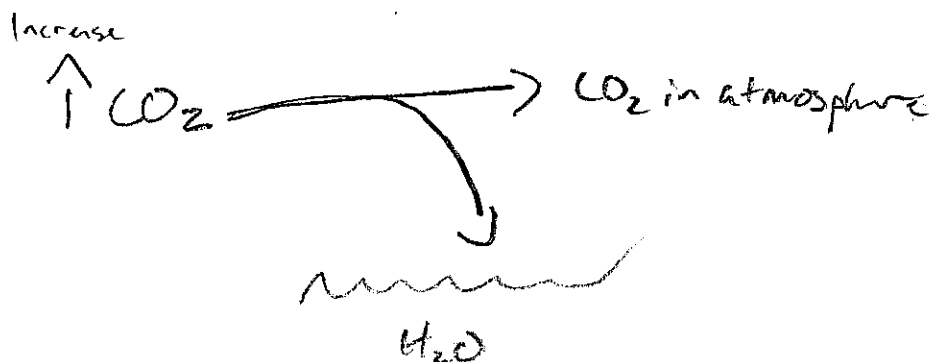
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would cause the oceans to be more acidic because there is more CO_2 to "react" with the water. Using the equation $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$ it shows that CO_2 reacts with water to form bicarbonate and a hydrogen atom. An increase in CO_2 would increase the amount of bicarbonate in water. ✓



25

Positive and negative feedback loops play a role in this. If there is an increase of CO_2 in the atmosphere, the temperature is likely to go up, raising the temperature of the water. Warm water absorbs less CO_2 than cooler water. If CO_2 is increased, this heats up the atmosphere causing more clouds to form which causes less energy to go to the earth, causing it to cool. A negative feedback occurs because cooler water absorbs more CO_2 . In reality, an increase in CO_2 in the atmosphere would cause more acidic oceans because the oceans would eventually be cooled down because many clouds will form from the temperature initially rising. I hope that made sense.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect occurs when the sun, which emits visible light, sends energy to the earth. From there a few things could happen. In a clear atmosphere, the energy would enter the atmosphere and either be absorbed by the earth or reflected back into the atmosphere. Since the Industrial Revolution, an increased amount of greenhouse gases are in our atmosphere so when the earth reflects back the energy (now it is infrared, which causes heat) the energy is absorbed by the greenhouse gases and then re-emitted in all directions. Once again the energy is either absorbed by the earth or reflected back into the atmosphere/greenhouse gases where a cycle occurs. When the sun's energy is reflected back into space, the atmosphere is not warmed up. However when infrared energy is absorbed by the greenhouse gases, this heats up our atmosphere causing the greenhouse effect. So, when volcanism is increased, this will cause a drastic increase in temperature because it intensifies the greenhouse effect, causing more absorption and less energy going out into space.

22

1 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is liquid to a gas where as degassing is the movement of gases in a liquid.

Earn up to 1 additional point on your course grade

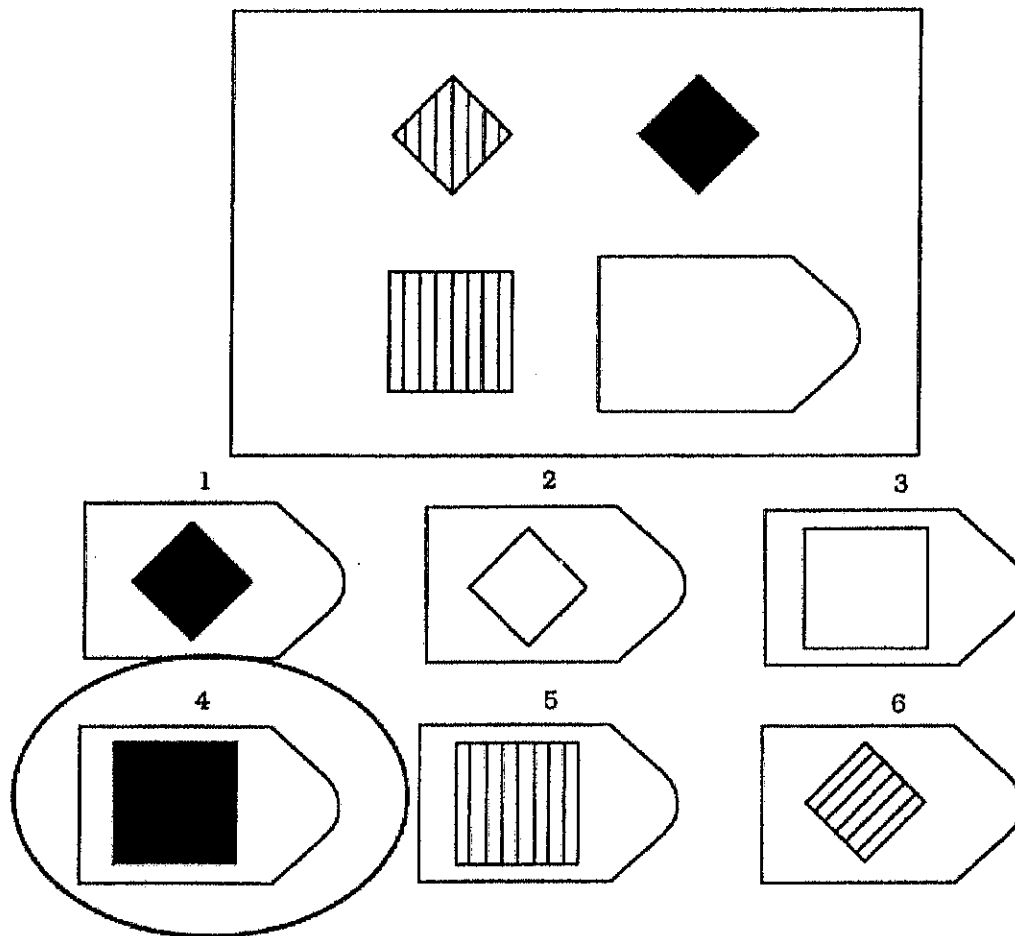
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

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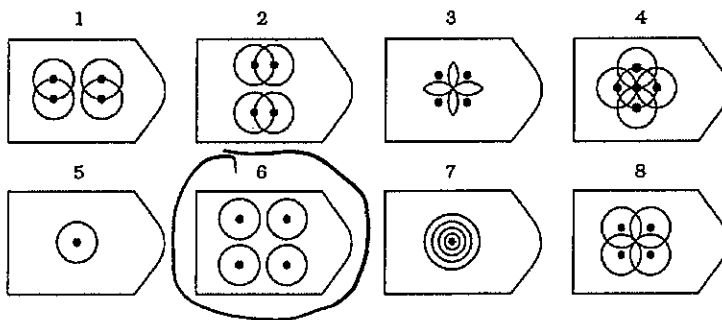
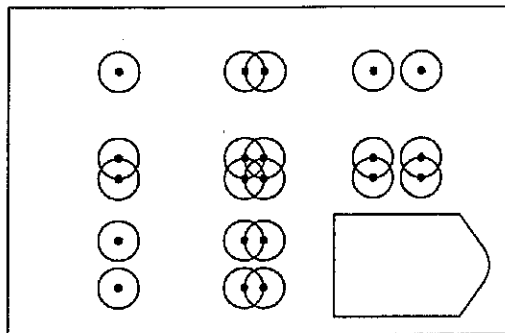


Answer: 4

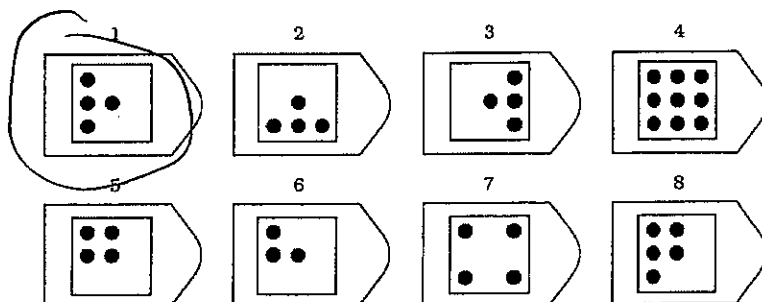
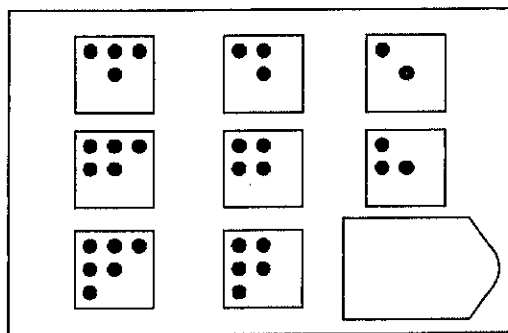
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

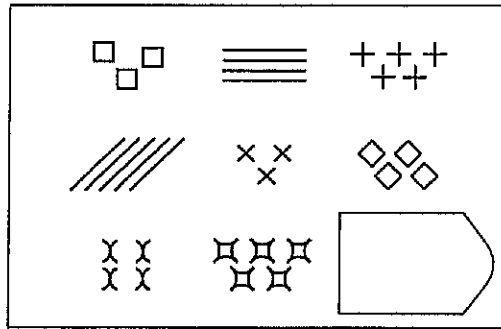


PATTERN 2

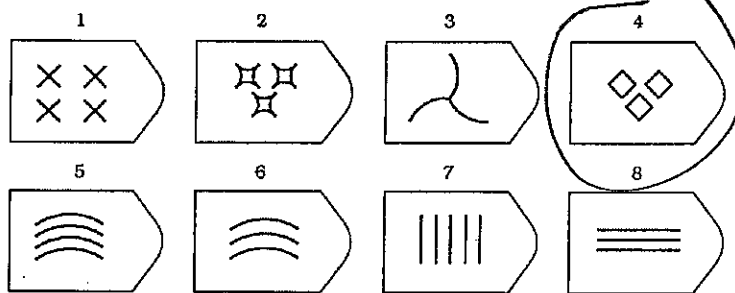


Q

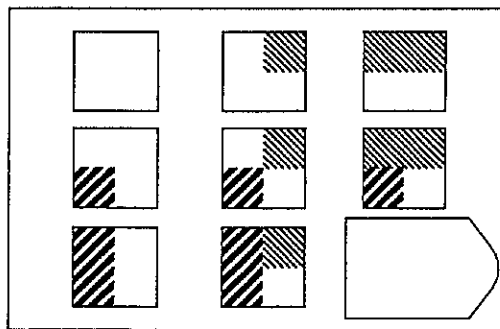
PATTERN 3



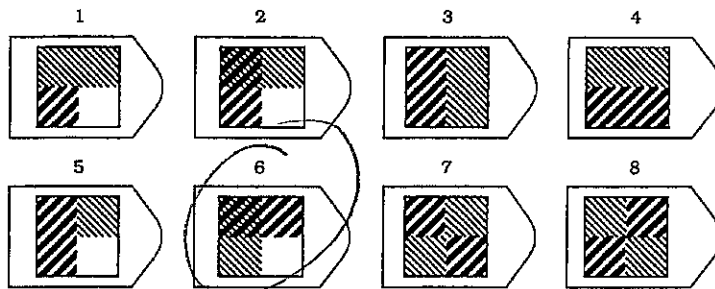
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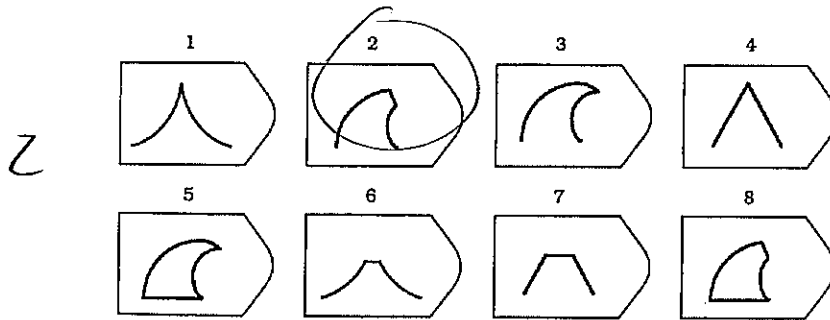
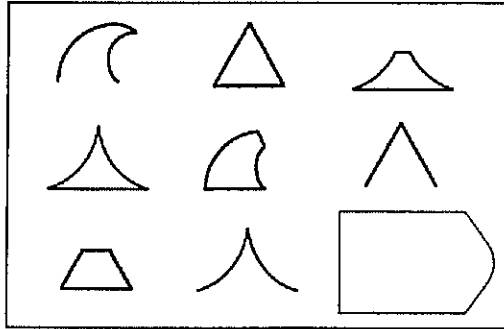


PATTERN 4



6



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
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PLEASE CONTINUE ON NEXT PAGE

Q

Please choose the best analogy to each of the following statements.

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A. While debugging their broken firewall, a programmer came across top-secret CIA files.

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D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48026

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: ~~XXXXXXXXXX~~
Version B A 4 0994271

GROUP: R

65

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

↑ temp ↑ trap form of clouds
↓ heat
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

CO₂ = CO₂ inflow
6. Which of the following would cause the acidity of Earth's oceans to decrease?
 - a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

temp \uparrow evap \uparrow clouds \uparrow

4

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

25 a) When there is an increase in atmospheric carbon dioxide, the amount of carbon dioxide in the ocean increases as well. Since there is a mass amount carbon dioxide in the ocean it needs to sort of find its equilibrium and even at CO_2 does this by reacting to the bicarbonate and hydrogen ions in the ocean and since acidity is a concentration of hydrogen in the ocean, the acidity level has increased. This is all due to the increased CO_2 in the atmosphere. Before I forget to add, if the average temperature of the ocean increased when the atmospheric carbon dioxide increased, then the warm water would have slowed down the process compared to the speedier ocean acidification process if the water had been cold. Either temperature doesn't really affect the increased acidity that results from the increased CO_2 .

b) A positive feedback is when an event (temp) continually increases throughout the process. So, increased CO_2 results in increased temperatures. Increased temperatures virtually end in increased global temperatures and increase of ocean temperatures. Then this ends up in increased levels of CO_2 that reacts with bicarbonate and hydrogen ions to find equilibrium. Finally, the acidity level is increased because its a concentration of hydrogen. That is a positive feedback.

A negative feedback would be an increased level of CO_2 in atmosphere with an increased temperature that would become a warm temperature for the ocean but the warm temperature would slow down the carbon dioxide which would result in a minor decrease of acidity levels.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature? - decrease in temp (can't really)
- ashes remain in air for a while, block solar

Your answer should include: radiation is decreased temp

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a) During the first stage of the greenhouse effect, solar radiation enters the atmosphere. Then, the Earth's surface absorbs the solar radiation and converts it into heat. Once the solar radiation is later converted into heat, the Earth's surface emits the heat back into the atmosphere where the greenhouse gases absorb the heat and re-emit the gas back to Earth which causes the warming of the earth. But, here comes the problem, if volcanism increases dramatically and large ash clouds erupt, the process of the greenhouse effect will be cut into. When large ash clouds are emitted into the atmosphere, it generally blocks solar radiation which is one of the first steps. By blocking solar radiation, the Earth's surface will not have anything to absorb which stops the whole purpose of greenhouse effect, which is to increase atmospheric temperature. So, the temperature will decrease during volcanism due to the blocking of the solar radiation and the inability to create heat.

b) I mentioned most of my connections between events and changes in my above answer, but when the eruption of large ash clouds occur, the ash clouds block the solar radiation that is the first step of greenhouse effect. If the solar radiation is blocked immediately then the earth is unable to absorb it, convert it to heat, and emit it back into atmosphere where the greenhouse gas absorbs the heat and re-emits it back to earth causing the warming temperature. So, the blocking of solar radiation obviously causes temperature to decrease because the eruption of ashes stop greenhouse effect from occurring.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation and degassing are similar because both deal with liquid and atmosphere, but different because they go the exact opposite direction. Evaporation goes from liquid to gas in atmosphere and degassing goes from gas in atmosphere to liquid.

Earn up to 1 additional point on your course grade

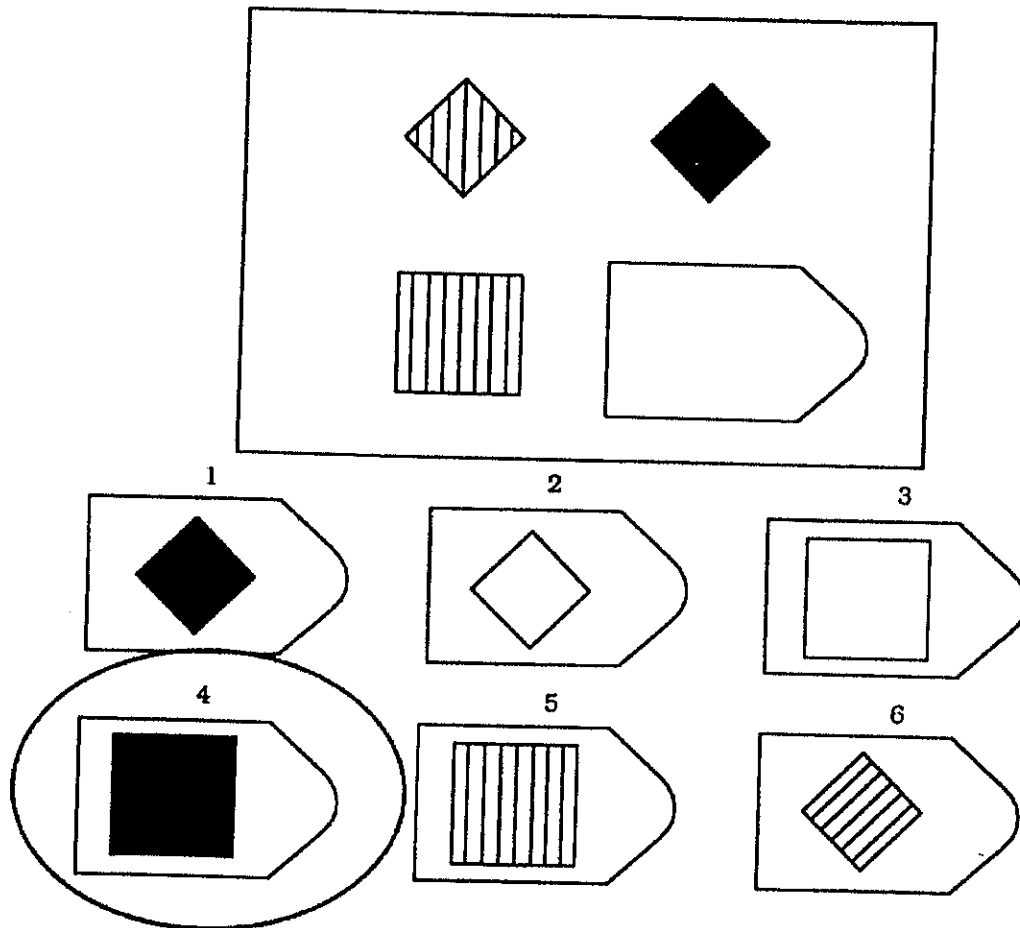
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

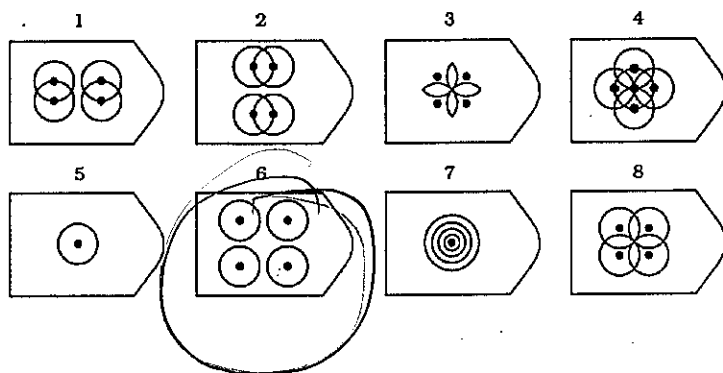
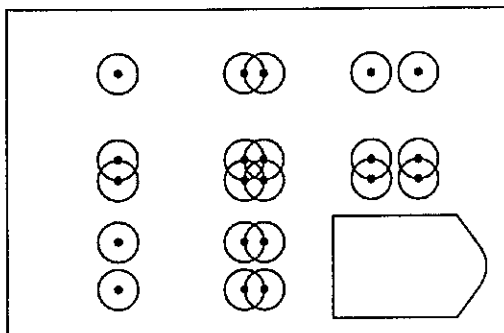


Answer: 4

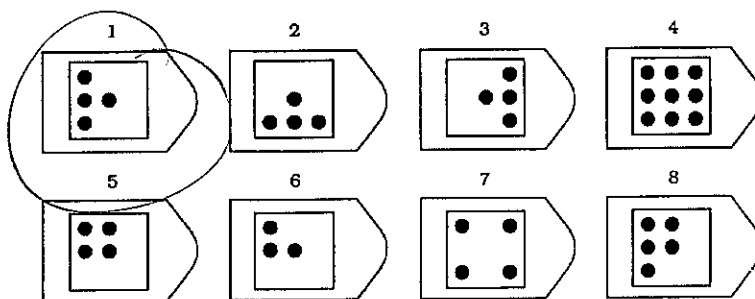
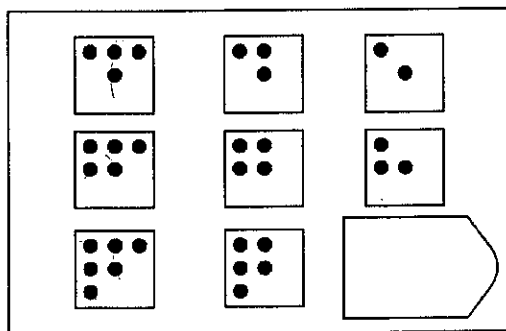
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

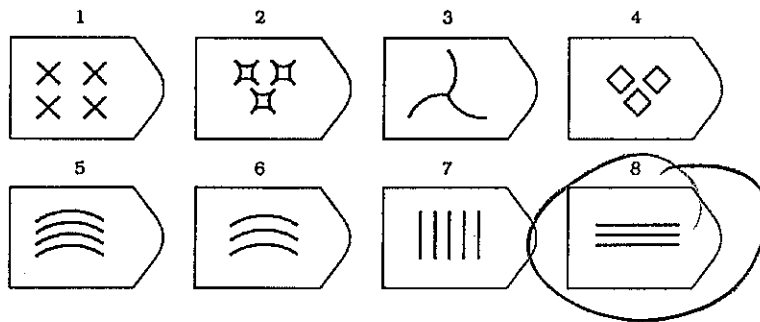
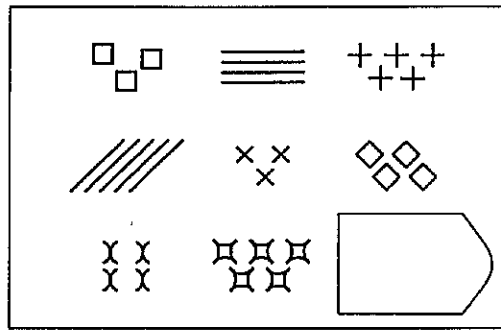
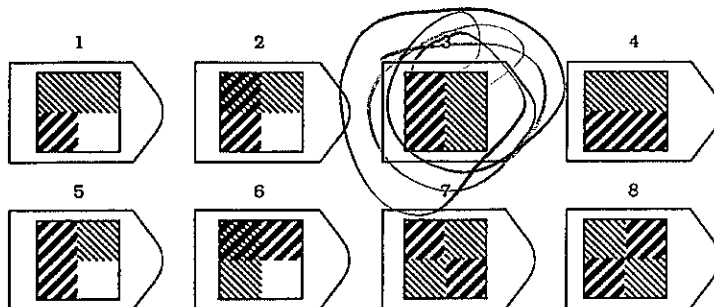
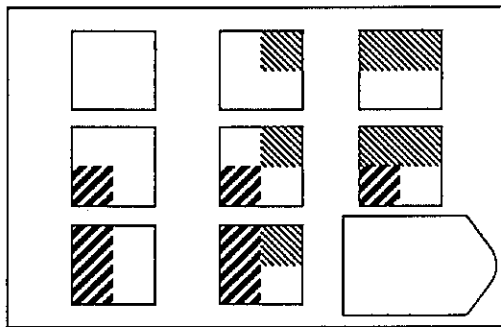
PATTERN 1



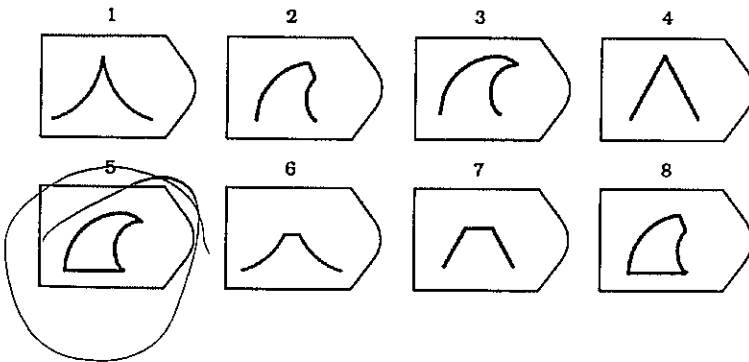
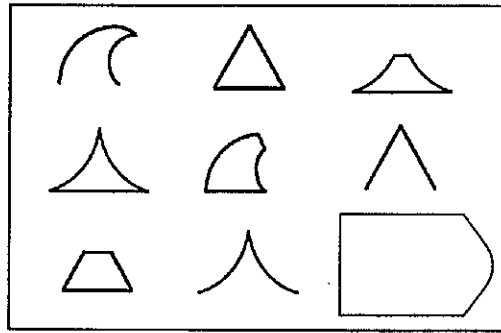
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

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-

Please choose the response that is closest to an analogy that you might make.

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- ☐ C. Being sleep deprived. They both involve impaired functions.
- ☐ D. Eating too much candy. They both involve lack of self-control.
- ☒ E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☐ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- ☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 60068

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A40688630
Version B

GROUP: R

77

MULTIPLE-CHOICE. 5 points each (50 points total).

- Which of the following would be considered a negative feedback to increasing global temperature?
 - Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ An increase in desert formation resulting in more dusting blowing into the atmosphere

Handwritten notes: dust particles in the atmosphere would block the sun's rays, allowing less visible light through, meaning less of a chance to heat through absorption of infrared energy. negative bc it would produce less of an increase in global temperature
- Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - The magma becoming colder
 - Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - ☒ Crystals forming in the magma
- Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - A = erosion, B = deposition, C = uplift and erosion
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 - The human and natural causes of the greenhouse effect are not understood.

Handwritten note: Setting on ocean floor
- Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

Handwritten calculations:
 Reservoir A: capacity = 30
 Reservoir B: capacity = 10
 $R.T. = \frac{CAPACITY}{INFLUX}$
 For A: $R.T. = \frac{30}{5} = 6$
 For B: $R.T. = \frac{10}{5} = 2$
- Which of the following would cause the acidity of Earth's oceans to decrease?
 - An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

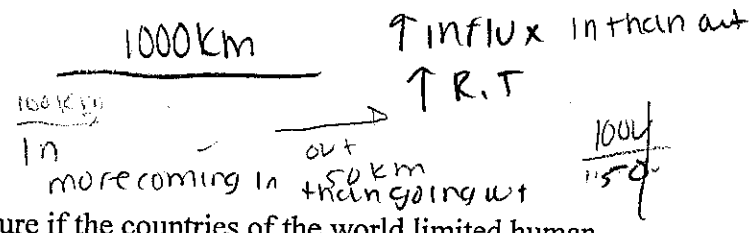
Handwritten notes:
 colder = less CO₂,
 A R.T. = 6, B R.T. = 2

100

100

100

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.
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Handwritten calculation: $\frac{1000}{50} \text{ RT} = 20 \text{ yr}$

Handwritten notes: $\uparrow \text{temp}$ $\uparrow \text{evap}$ $\uparrow \text{cloud}$

- negative feed back b/c rays are blocked by clouds allowing not as much solar radiation through, decreasing the chance of more getting absorbed by the earth's surface and turning into heat instead energy

neg feed back b/c \uparrow in temp causes less of atmospheric heating due to cloud formation. Equilibrium is trying to be met!

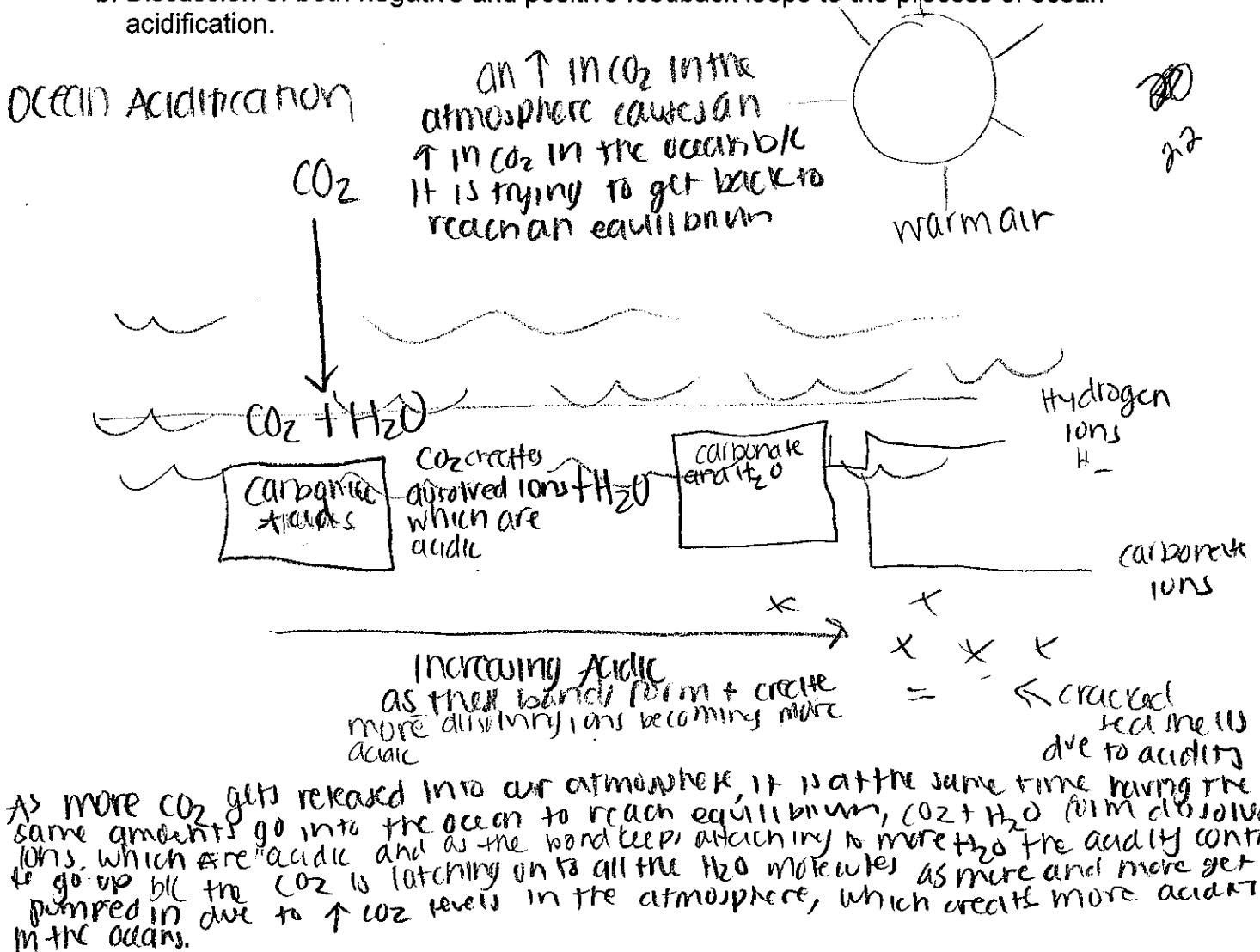
Handwritten notes: reflects it back into atmosphere and it gets lost back in space not heating or making more heat energy through absorption cooling still

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.



1) Permafrost: As the temps ↑ glaciers and ice melt and "thaw" this process lets out methane which is attracted to gng and will be absorbed and re radiated + emitted. As more methane is released, more heat energy is being let out and absorbed into the green house leading to increasing temperatures. This is a positive feed back because the event of permafrost melting/thawing due to temp ↑ creates more and more of the same process, pushing away from equilibrium.

2) ↑ temperatures which then ↑ evaporation, ↑ cloud formations, essentially allowing less solar radiation through the earth's atmosphere due to the clouds blocking. This slows the process of heating, essentially returning to an equilibrium cooling down the earth from the previous rising temperatures. This is a negative feed back b/c the event of ↑ temp creates less of a →

heating of the earth due to the blocked rays. Eventually
returning the atmosphere to an equilibrium by
cooling the earth will not do much in light due to the
clouds

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

25

Volcanism can be caused by a process called "melting" the stones beneath the surface are subject to heat up/melt turning to a more liquid form from the molten rock by photochemical precipitation. These rocks can melt when they get wet, just from water. Water can get below to the rocks when ocean and land plates are subducting the water that reaches down to these rocks heat them up, causing their density to decrease and energy to start moving faster, creating less space eventually heating up enough to break through and begin to rise, the molten rock is now a hot lava emerging upwards eventually exploding, crystals forming driving the magma up and bringing w/ its force particles, dust etc from underground creating large ash clouds in the atmosphere, blocking the suns rays not allowing as much solar radiation through to create? through absorption + re-emission heat energy to be re-emitted back into the atmosphere to the greenhouse gases for more absorption and energy. If the plates continued to subject the molten rocks to melting and erosion by subducting into one another these ash clouds could block lots of sunlight creating cooling. This however would not have a long term significant effect on the earth's atmosphere because it does not create a feedback.

- The greenhouse effect would be affected by the sunlight's visible light which is radiated through the atmosphere in visible and IR solar radiation, not absorbed by the molecules in the atmosphere allowing them to hit the earth's surface. At the surface they are either reflected (by glaciers, ice, etc) and sent back into space creating no heat. A lot of this creates cooling (the ice age). When not reflected the IR is absorbed and converted into a heat energy in the surface then re-emitted into the atmosphere, where it is re-absorbed. Of this energy occurs by greenhouse gases. The absorb and radiate energy shooting the IR back through the atmosphere creating a cycle and heating (global warming). ↑ level of CO₂ from fossil fuels, CO₂ from rocks in the rocks in volcanoes being surfaced and adding to the atmosphere then increase heating as well.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

degassing is the chemical change in a calcium isotope from a rock to sediment to dust being blown downwind having molecules + atoms too small to be visible. Much like evaporation from water to a vapor into our earth's atmosphere through 7+cm/s.

43

2

1. The first part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

2. The second part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

3

Earn up to 1 additional point on your course grade

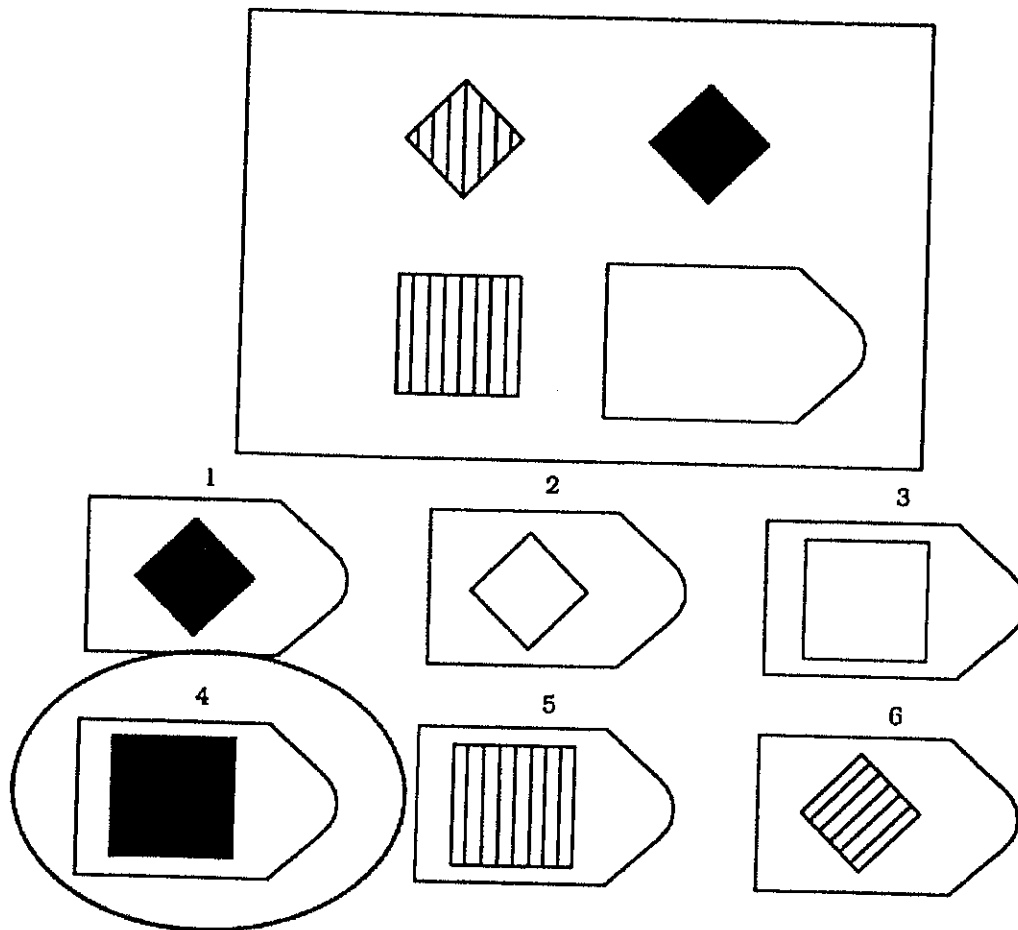
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

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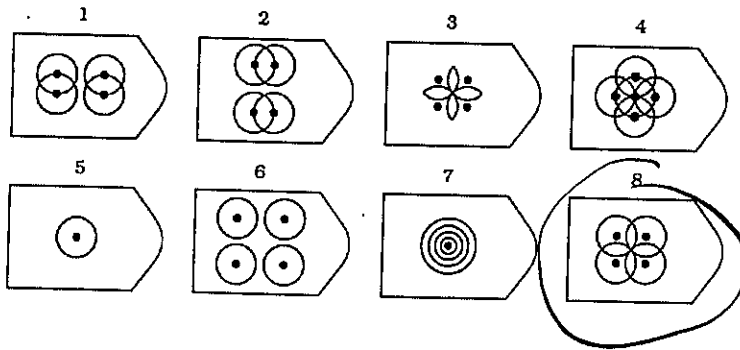
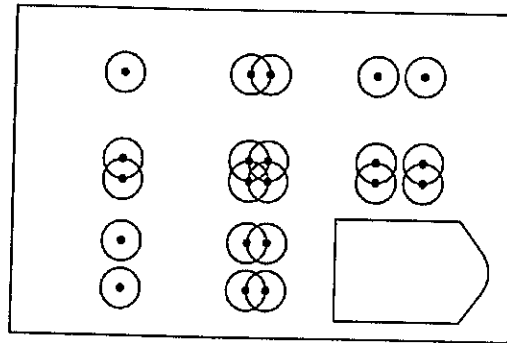


Answer: 4

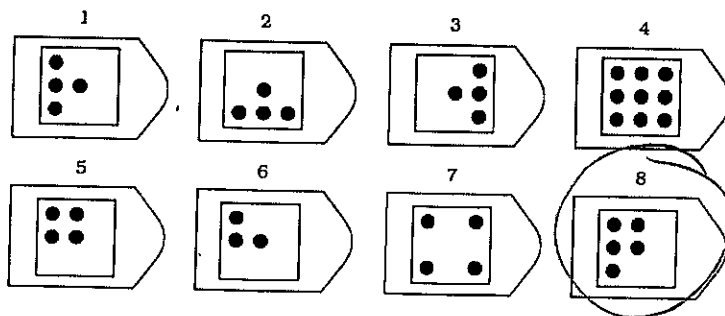
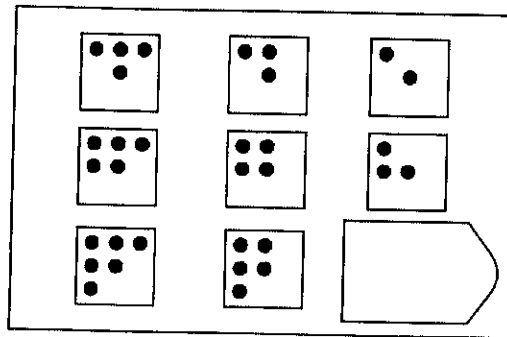
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

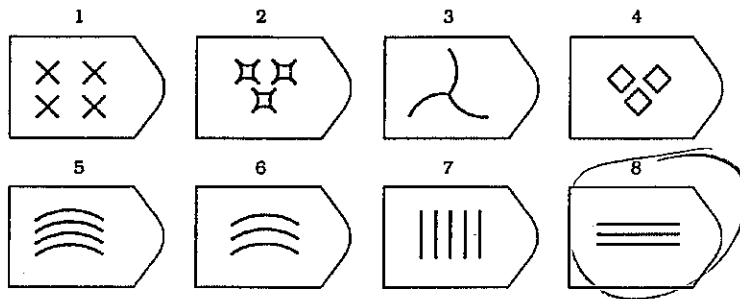
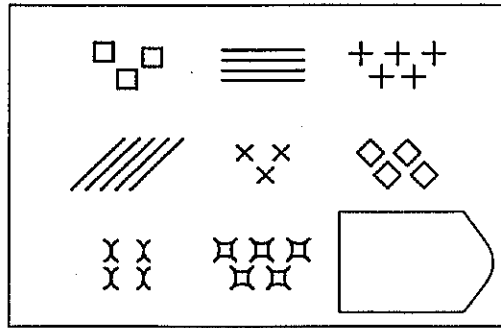


PATTERN 2

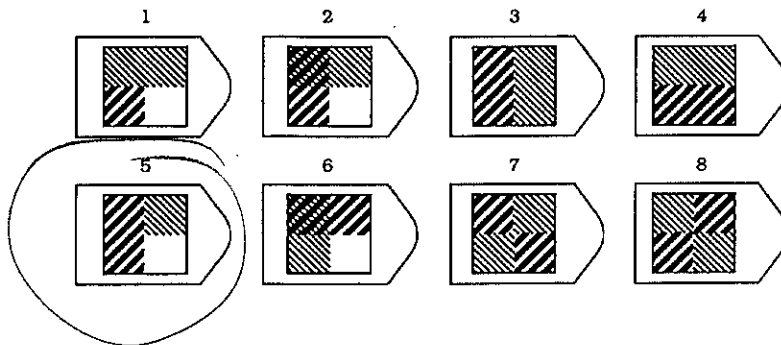
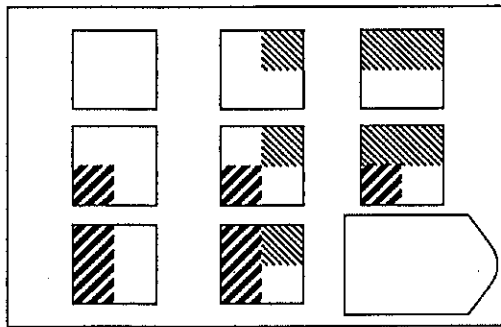


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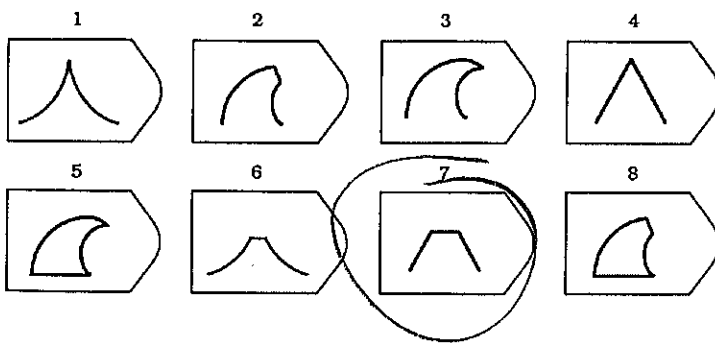
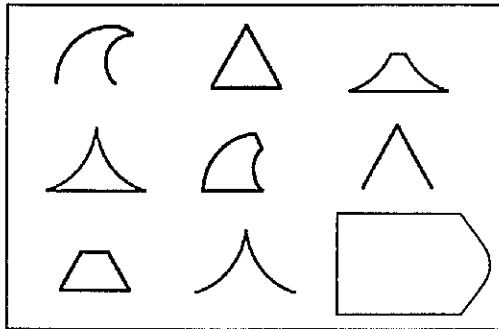
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

☒ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 40804

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

1

1

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1

1

STUDENT NAME: A40711436
Version A

GROUP: R

85

MULTIPLE-CHOICE. 5 points each (50 points total).

- D** 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ~~a.~~ The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ~~c.~~ The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- B** 2. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - (b)** Melting of permafrost resulting in more methane escaping into the atmosphere
 - ~~c.~~ An increase in evaporation and cloud formation resulting in the release of latent heat
 - ~~d.~~ An increase in desert formation resulting in more dusting blowing into the atmosphere
- C** 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ~~a.~~ A = erosion, B = deposition, C = uplift and erosion
 - ~~b.~~ A = erosion, B = biochemical precipitation, C = uplift and deposition
 - (c)** A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - ~~d.~~ A = dissolution, B = deposition, C = uplift and deposition
- C** 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - (c)** Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ~~d.~~ Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ~~e.~~ The human and natural causes of the greenhouse effect are not understood.
- A** 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- (a)** An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ~~b.~~ A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ~~c.~~ A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- B** 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - (b)** Reservoir B has a shorter residence time than Reservoir A.
 - ~~c.~~ Reservoir A and Reservoir B have equal residence times.
 - ~~d.~~ More information about Reservoir A and Reservoir B is needed.

- B 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year. Which of the following statements is true?
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.
- A 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- B 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- A 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☐ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

25

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

1: Ocean acidification is the process of CO_2 + H_2O entering the ocean to form bicarbonate ions + hydrogen ions. The concentration of hydrogen ions is what makes the ocean's acidic. When the temp of the ocean is colder the water can hold more CO_2 because ^{CO_2 molecules} they are less likely to escape because they aren't moving fast. When the ocean water is warmer, the CO_2 molecules are moving faster + makes it easier for them to degass into the atmosphere. 6/6

3: Positive feedback loops accelerate change in the global climate system and negative feedback loops decelerate change in the global system.

Positive feedback in the process of ocean acidification:

→ If there was an increase in global temperature this would cause more evaporation of CO_2 from the oceans to the atmosphere. With more CO_2 in the atmosphere this will cause an increase in atmospheric temp; and ↑ in atmospheric temp causes the global climate to ↑, which causes the temp of the ocean water to ↑, + more CO_2 will be degassed. (Pos bc all are going in the same direction.)

Negative feedback: If there was a ↓ in water vapor in the atmosphere due to a decrease in temp, less precipitation will happen, which means there will be less CO_2 entering the ocean. Less CO_2 entering the ocean will be less of bicarbonate/hydrogen ions forming, so the overall ocean acidification won't become more acidic it will be less acidic.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Attached description on back of pg 3

Volcanism degassing happens when a volcano erupts & CO_2 is being released into the atmosphere. One of two things can happen here in regards to atmospheric temperature. The big ash cloud can block the solar radiation from the sun resulting in less sunlight reaching the earth's surface. If less sunlight reaches the surface ~~the process of the greenhouse effect would decrease~~ & global temps will be decreasing. The other possible influence on atmospheric temperature is the release of CO_2 into the atmosphere that would cause temps to increase.

Atmospheric temp changes when more CO_2 is degassed from the oceans for instance resulting in more CO_2 into the atmosphere which causes the temperature to rise. When the temp rises more evaporation occurs, which causes more condensation and eventually precipitation.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Similar because an ocean can degassing (release) CO_2 into the atmosphere just like water can evaporate from the surface. Basically a molecule of liquid is converted to a gas to be considered evaporation. A molecule can degass from the hydrosphere into the atmosphere.

Both releasing a something into the atmosphere

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

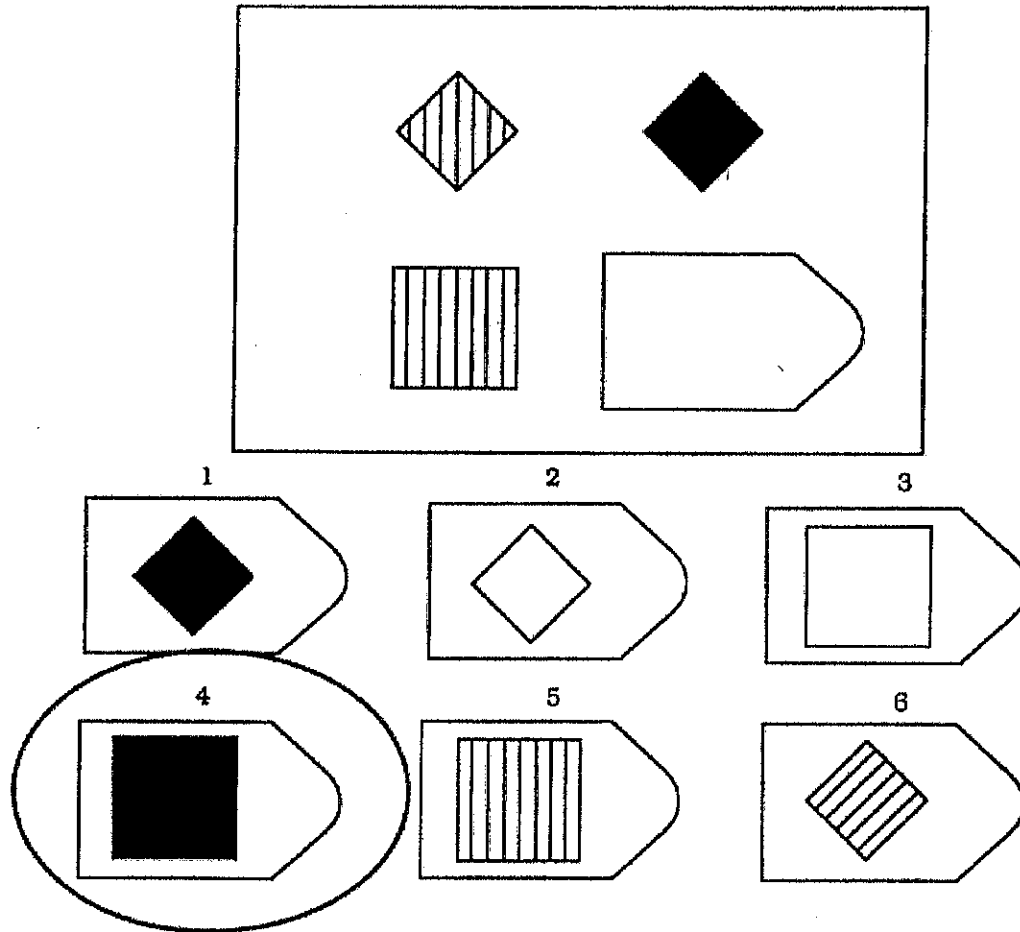
the greenhouse effect is the process of solar energy heating the atmosphere. The sun has many forms of ~~heat~~ energy, but visible energy is the most imp. for the greenhouse effect to occur. The visible light can easily travel thru the atmosphere to reach earth because greenhouse gases/other gases in the atmosphere can't easily absorb this visible light. When the visible light reaches Earth it is reflected ~~out~~ back into space or absorbed by Earth's surface. If it's reflected this means no production of heat & it is lost into space. When the visible light is absorbed by Earth's surface it is converted to infrared heat energy & emitted into the atmosphere. Greenhouse gases become excited & energetic when they absorb infrared energy and re-emit in all different directions. Some of this infrared heat energy reaches Earth's ^{again} surface and some stays in the atmosphere. The presence of infrared heat energy is what is actually causing global warming!



Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

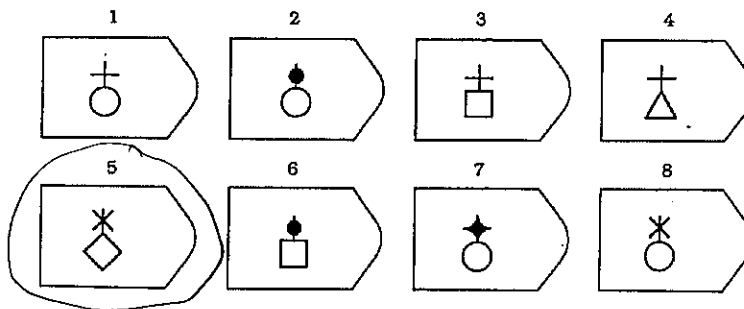
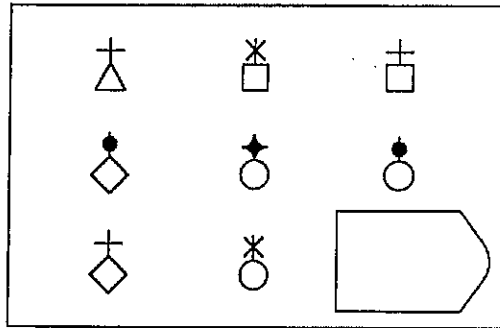


Answer: 4

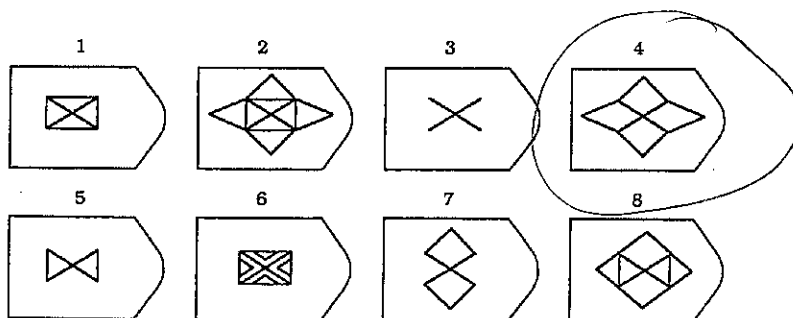
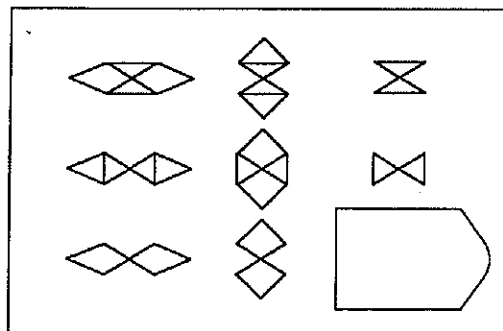
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Please choose the image that best completes each of the following patterns.

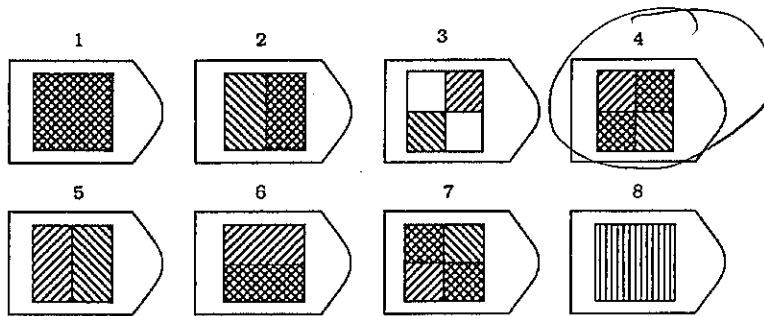
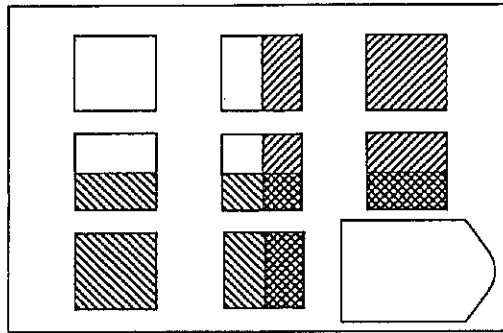
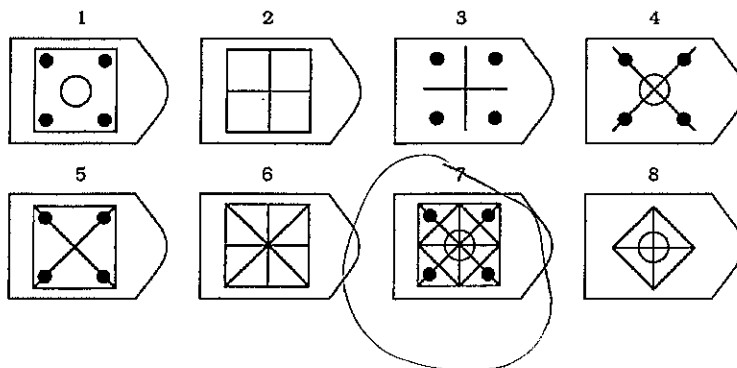
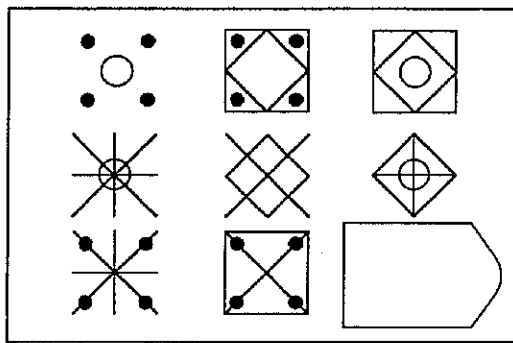
PATTERN 1



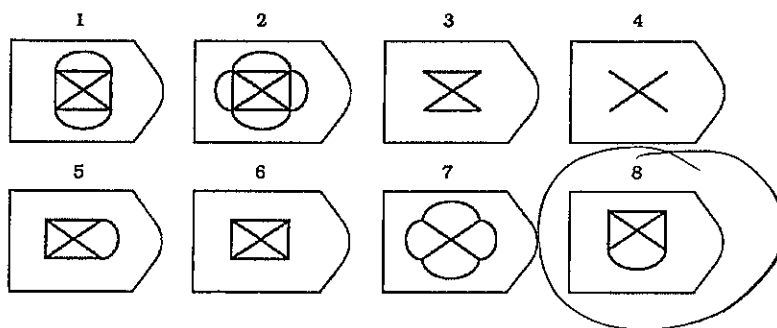
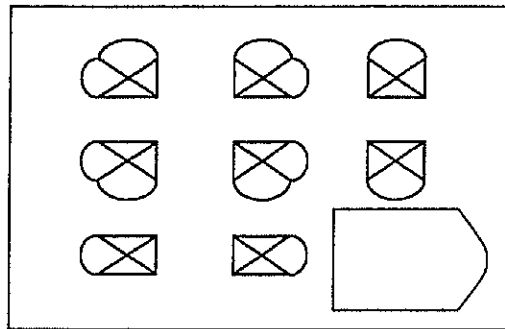
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48160

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A 39979826
Version A

GROUP: R

21

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- B
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

☒ 2. Which of the following would be considered a negative feedback to increasing global temperature?

- C
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

B ☒ 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A= erosion, B= deposition, C= uplift and erosion
- ☒ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
- c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
- d. A = dissolution, B= deposition, C= uplift and deposition

D ☒ 4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- a. Human activities are the primary cause of the greenhouse effect.
- b. Natural processes are the primary cause of the greenhouse effect.
- c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
- ☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
- e. The human and natural causes of the greenhouse effect are not understood.

C ☒ 5. Which of the following would cause the acidity of Earth's oceans to decrease?

- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
- b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
- ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

B ☒ 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- a. Reservoir A has a shorter residence time than Reservoir B.
- ☒ b. Reservoir B has a shorter residence time than Reservoir A.
- c. Reservoir A and Reservoir B have equal residence times.
- d. More information about Reservoir A and Reservoir B is needed.

- B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- B 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- D 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would affect ocean acidification by causing an increase in the ocean's ~~temperature~~ ^{temperature}. Also an increase in carbon dioxide would create more an for the earth's atmosphere to absorb & return as oxygen? This would be considered a positive feedback for the increase in atmospheric carbon dioxide also creates an increase in the Earth's temperature in the atmosphere. A negative feedback would be the increases in Earth's atmosphere causing other forms of life a struggle when trying to survive in increased climates.

1

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If a volcano on Earth suddenly erupts leaving a large amount of ash clouds the Earth's temperature would initially remain the same. If the dust particles were to remain in the atmosphere for an extended period of time the Earth's climate would change because the dust particles would block UV [?]. rays coming from the sun that warm the Earth's atmosphere. This also means the greenhouse [?] effect would be increased for no light rays would be able to leave Earth's atmosphere or enter Earth's atmosphere.

5

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They are similar because both are a way to elevate/release a chemical/substance from a substance.

Earn up to 1 additional point on your course grade

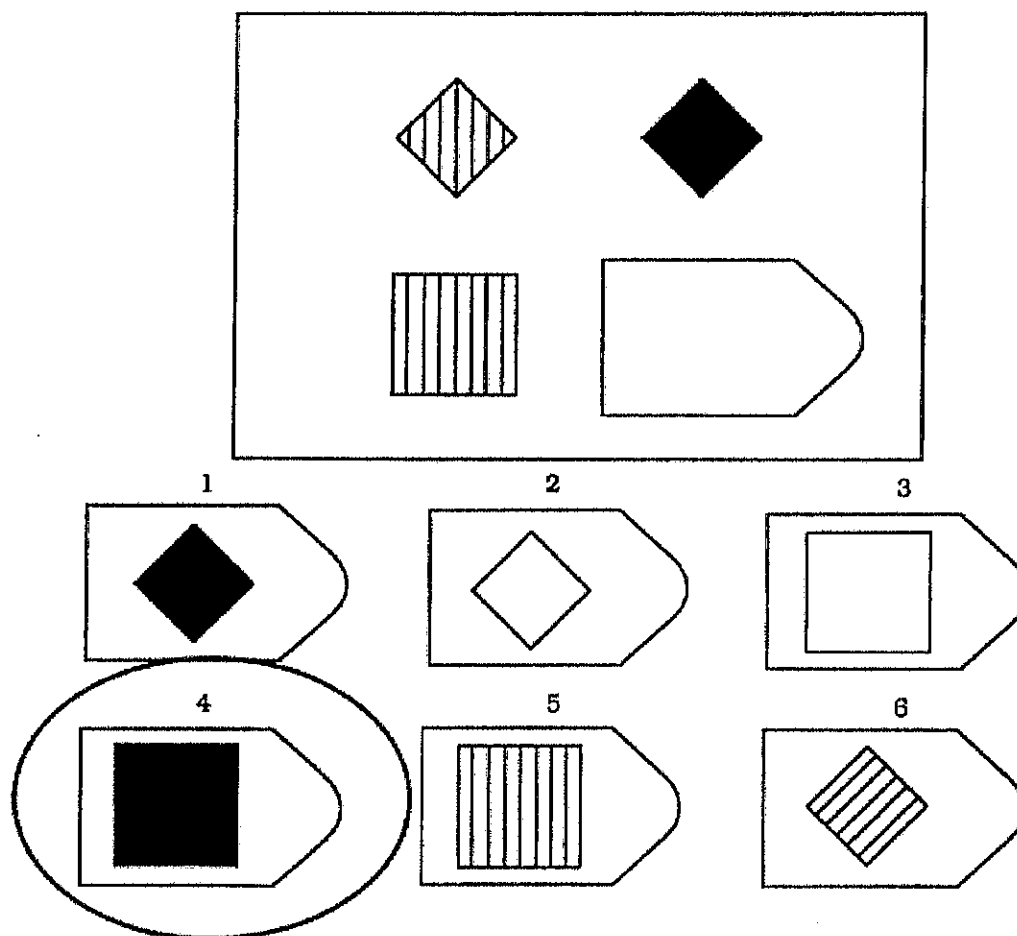
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

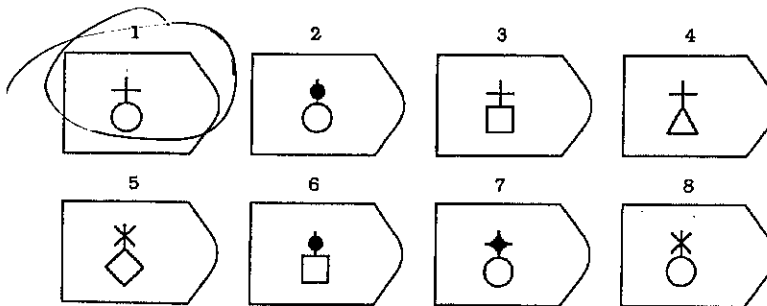
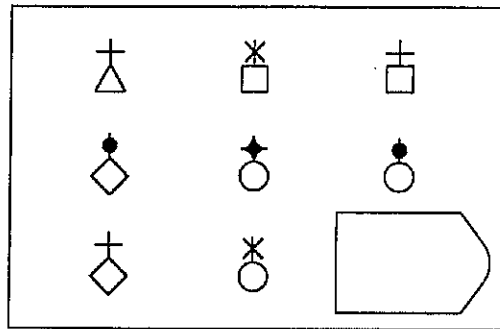


Answer: 4

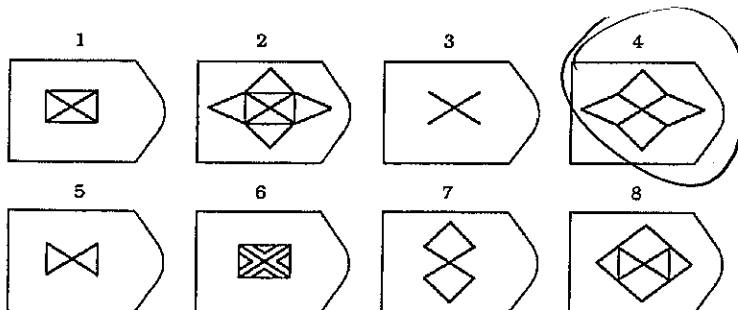
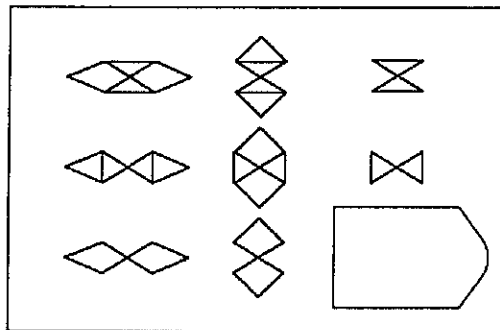
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Please choose the image that best completes each of the following patterns.

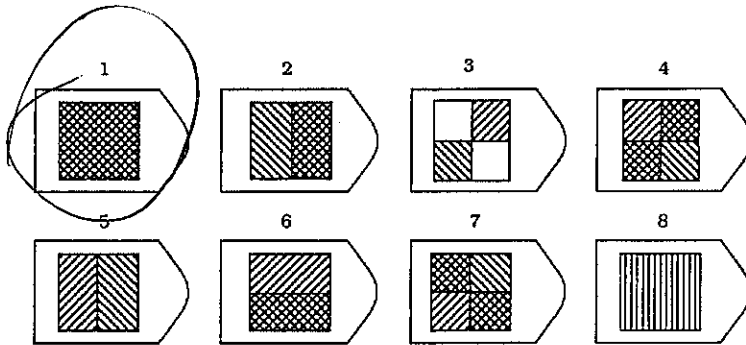
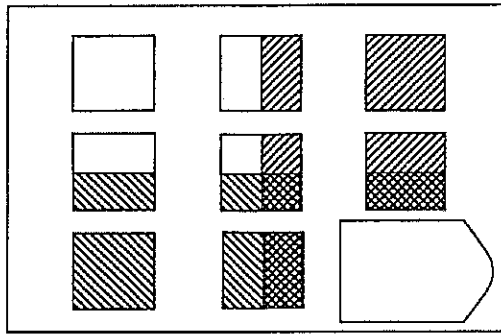
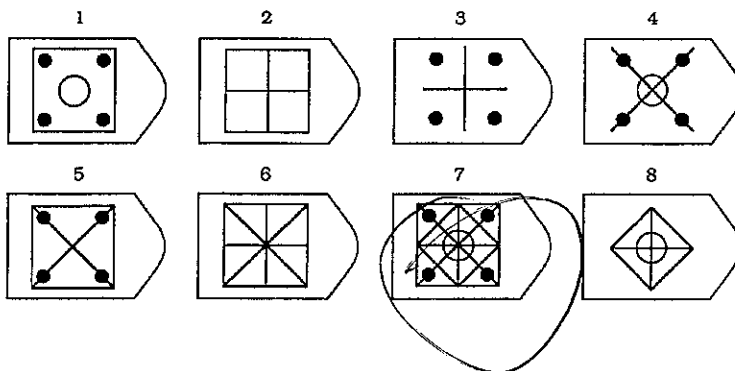
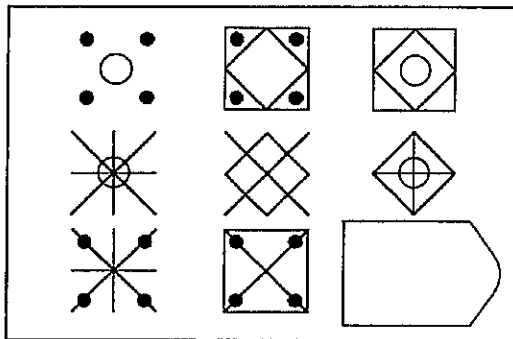
PATTERN 1



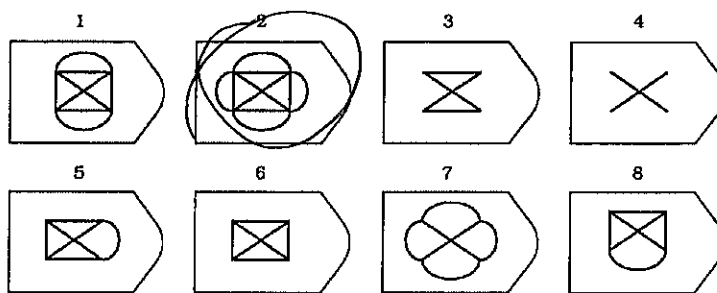
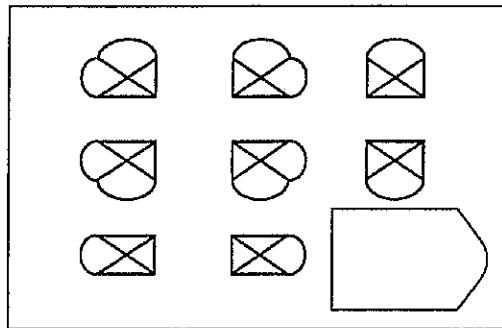
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.
 - A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
 - ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
 - C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
 - D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.
 - A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
 - B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
 - C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
 - ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.
 - ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
 - B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
 - C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
 - D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.
 - A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
 - B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
 - ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
 - D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- ☒ B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- ☒ C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48430

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other


STUDENT NAME: A43294133
Version B

GROUP: 5

97

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
dust =
block visible
light =
↓ temp.
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
less dense
☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
☐ a. A = erosion, B = deposition, C = uplift and erosion
☐ b. A = erosion, B = biochemical precipitation, C = uplift and deposition
☐ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
☒ d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
☐ a. Human activities are the primary cause of the greenhouse effect.
☒ b. Natural processes are the primary cause of the greenhouse effect.
☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☐ e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
☐ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.
$$r.t = \frac{200}{2} = 100 \quad \frac{100}{2} = 50$$
6. Which of the following would cause the acidity of Earth's oceans to decrease?
☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

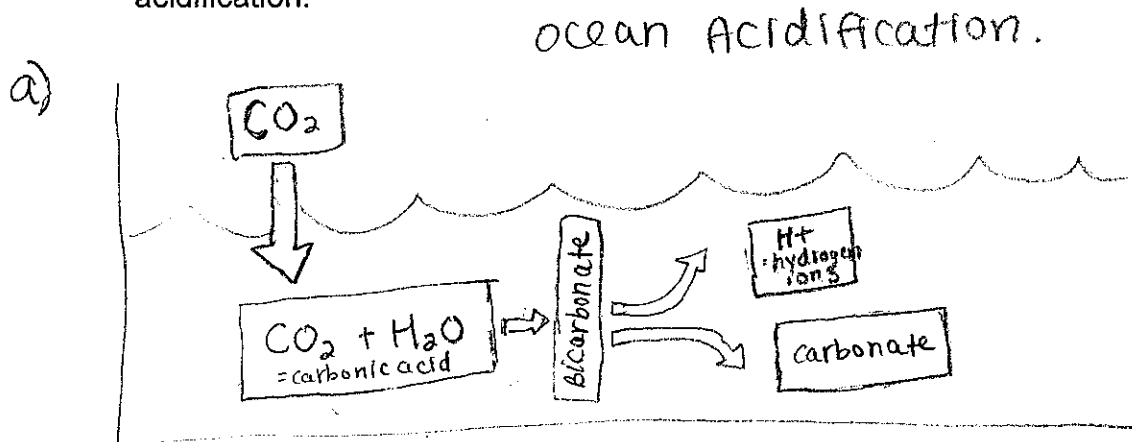
7. A reservoir is 1000 km³ in size, has an influx of 100 km/year and an outflow of 50 km/year. Which of the following statements is true?
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates? *- still adding g.g into atmosphere*
- ☐ a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☐ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- 

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.



CO_2 in the atmosphere enters the ocean by the principle of equilibrium. CO_2 needs to be balanced in the system so it moves from the atmosphere to the ocean to maintain equilibrium. When CO_2 enters the ocean, it combines with H_2O molecules to form carbonic acid. The carbonic acid is unstable, so it divides into bicarbonate & eventually carbonate, and also hydrogen ions. The hydrogen ions increase the acidity of the oceans, so the ocean becomes acidic when CO_2 enters the ocean & hydrogen ions are formed.

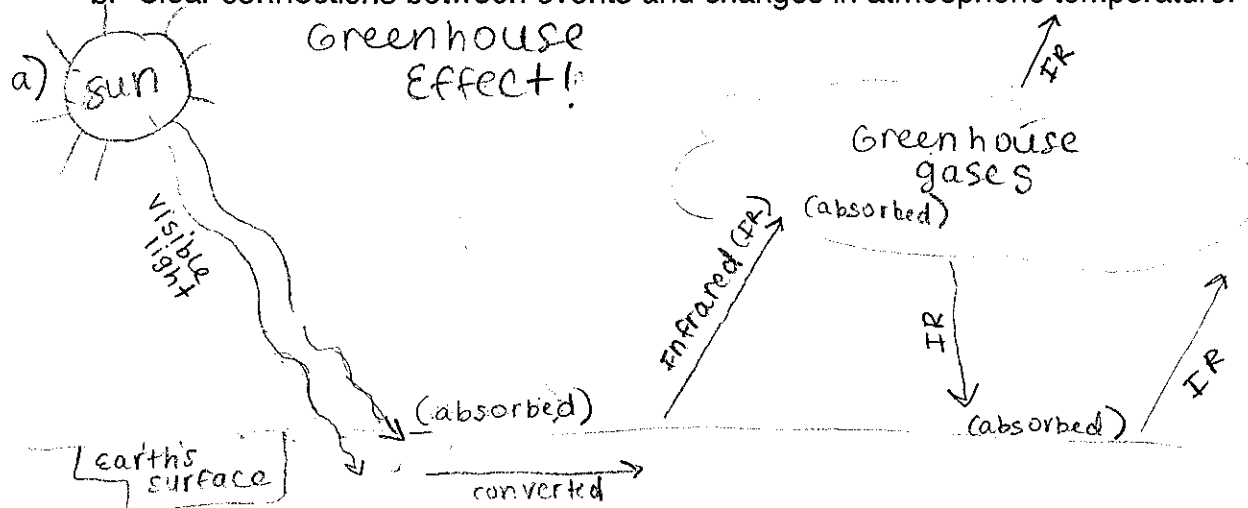
b) **POSITIVE FEEDBACK:** Increasing CO_2 in the atmosphere would increase CO_2 in the oceans. Because of the principle of equilibrium, the CO_2 moves to the ocean to maintain equilibrium between the atmosphere and the ocean. Thus, if you add CO_2 into the atmosphere, there will be more in the atmosphere than the ocean so CO_2 moves into the ocean to balance out. With more CO_2 in the ocean, more hydrogen ions will be formed through the process of ocean acidification and so the ocean will become more acidic. Overall, an increase in atmospheric carbon dioxide will cause a further change in an increase in CO_2 in the oceans, and as a result an increase in ocean acidity.

NEGATIVE FEEDBACK: Increasing CO_2 in the atmosphere would decrease CO_2 in the oceans. Adding more CO_2 in the atmosphere increases the temperature of the atmosphere through the process of the greenhouse effect. Increasing the temperature of the atmosphere also increases the temperature of the oceans. In warmer oceans, molecules are moving faster and do not hold as much CO_2 as colder oceans. Thus with the warmer oceans, not as much CO_2 will enter the oceans, decreasing the CO_2 amount & the ocean's acidity.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.



25 The sun gives off visible light. While some of the visible light is reflected away back into space, some of it reaches the Earth's surface and gets absorbed in it. The visible light that is absorbed gets converted into infrared (heat energy) and is emitted from the surface back into the atmosphere. Some of this infrared gets lost into space, but some of it gets absorbed by the greenhouse gases in the atmosphere. The greenhouse gases become excited and re-emit the infrared back out in all directions, so again, some of the IR goes to space while some of it emits back toward Earth. The Earth will absorb the IR and emit it back out, where it again may be absorbed by greenhouse gases in the atmosphere. This is the "trapping effect" of the greenhouse effect where heat becomes trapped in the atmosphere.

- b) An increase in volcanism would result in an increase in volcanic ash in the atmosphere. The ash clouds that form can block much of the sun's visible light from reaching the Earth's surface. If no visible light reaches the surface none can be absorbed and converted into IR for the greenhouse effect to continue. The ash clouds would cut off the greenhouse effect and so atmospheric temperature would decrease.

(Once the ash were to be removed, the temperature would rise once again because the greenhouse effect would be able to continue at that point)

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

2 Evaporation is the process of liquid turning to a gas, whereas degassing is the process of gas moving from liquid to air. There is no chemical change in degassing because it is always gas.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

1. b) NEGATIVE FEEDBACK (continued):

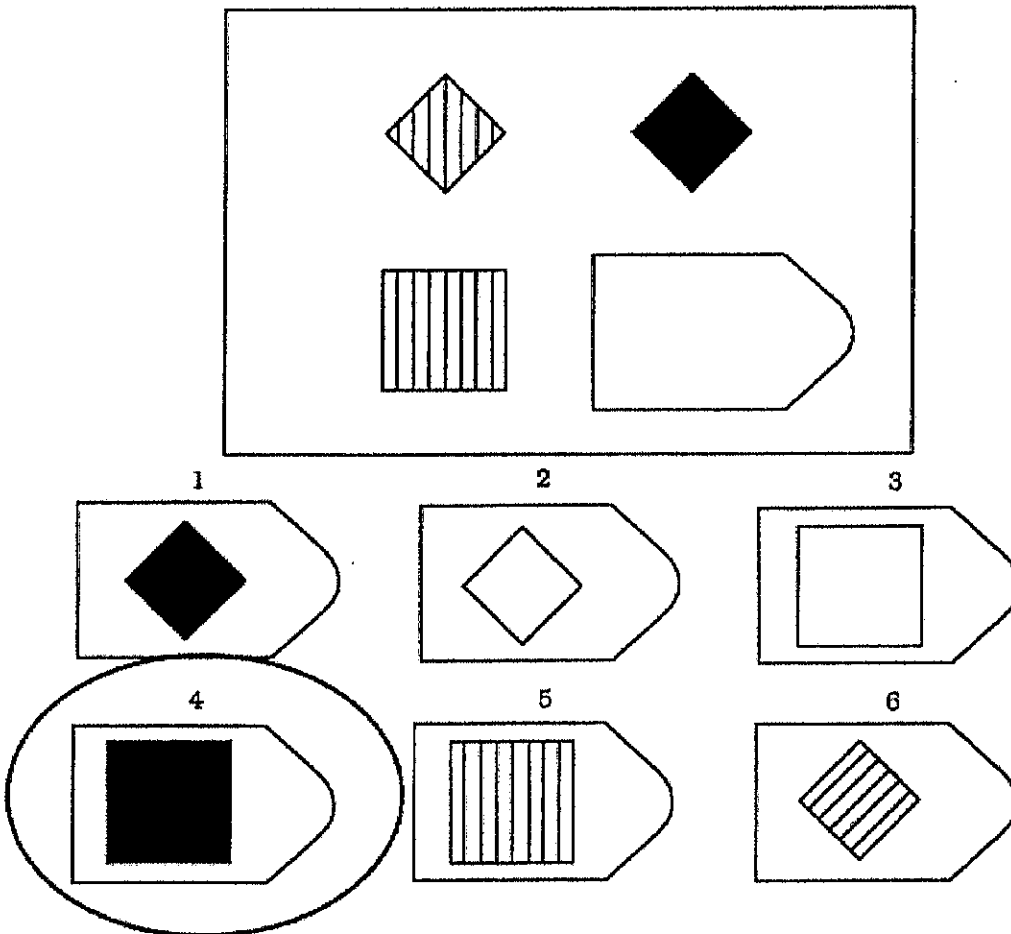
overall, an increase in atmospheric carbon dioxide will cause a decrease in ocean carbon dioxide, as well as acidity.

(this negative feedback process does not have as great of an effect on ocean acidity as does the positive feedback, but it still exists.)

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

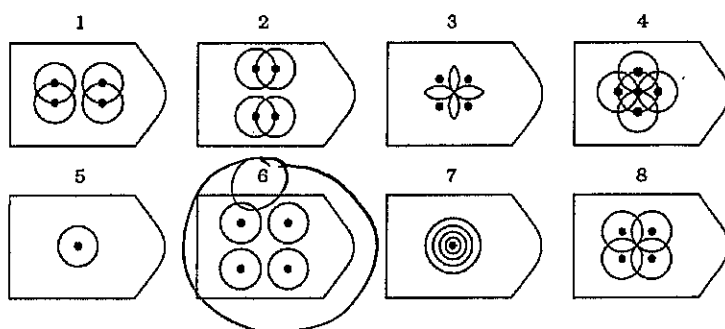
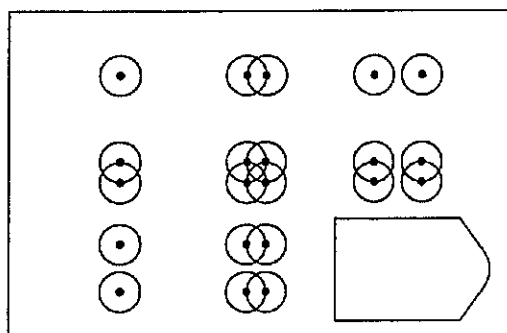


Answer: 4

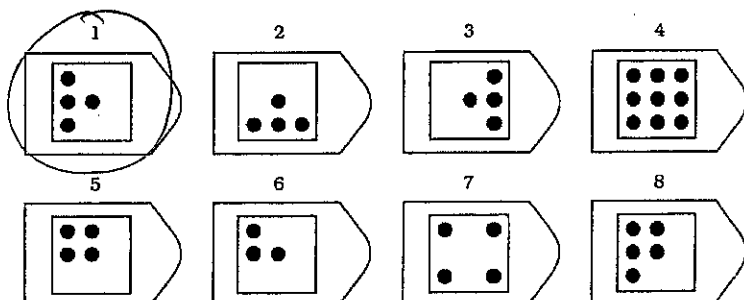
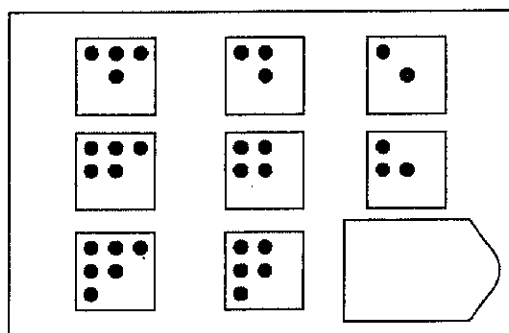
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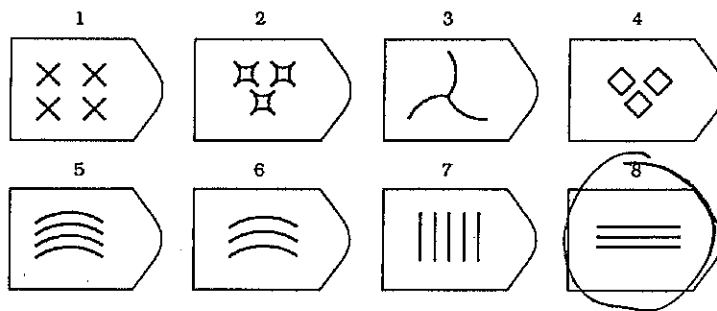
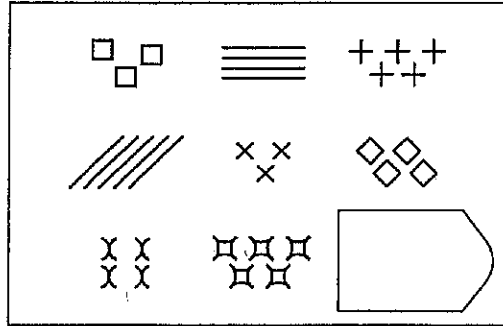
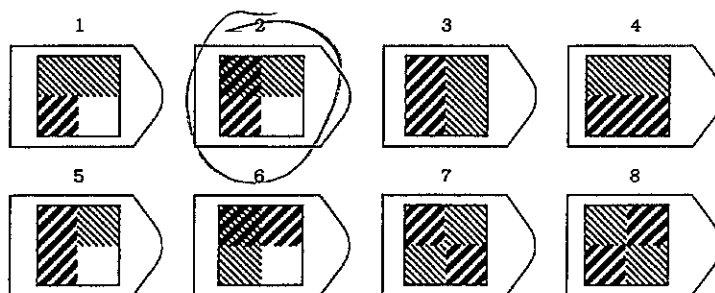
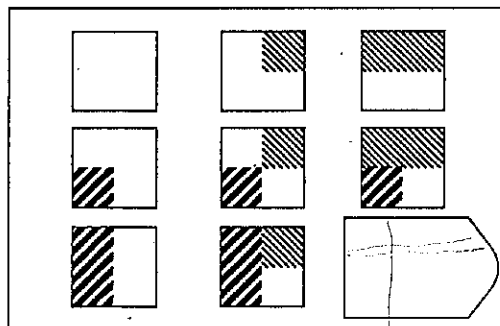
Please choose the image that best completes each of the following patterns.

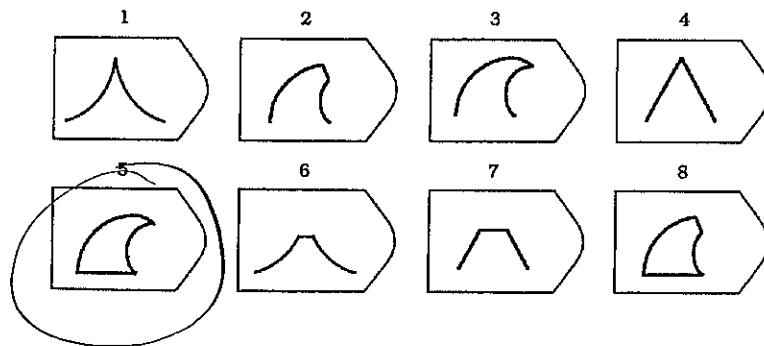
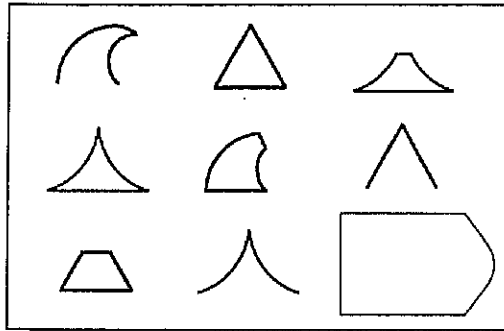
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - ☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - ☐ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48864

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A43292970
Version B

GROUP: S

92

MULTIPLE-CHOICE. 5 points each (50 points total).

↗ Dampens the increase

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed *More absorption = warmer +*
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere *More greenhouse = warmer +*
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
↳ Less rays absorbed -

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder *less buoyancy*
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter *less buoyancy*
 - d. Crystals forming in the magma *slows down magma*

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B *deposition* and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
uplift/erosion

- ☒ a. A= erosion, B= deposition, C= uplift and erosion
- b. A = erosion, B= biochemical precipitation, C= uplift and deposition *x*
- c. A= dissolution, B= biochemical precipitation, C= uplift and erosion *x*
- d. A = dissolution, B= deposition, C= uplift and deposition *x*

4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect. *x*
 - e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

$$\frac{A}{10} = 4 \quad \frac{B}{10} = 2$$

6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

Higher temp. causes ocean to lose more CO₂ in evaporation. So less CO₂ = less ocean acidification.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear. \times
 b. The reservoir is not in equilibrium.
 c. The reservoir is growing smaller. \times
 d. The reservoir's residence time is 10 years.

↑
 Influx & outflow → $< \text{influx}$
 are different.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
 b. The Earth's atmosphere would become warmer than it is today.
 c. The Earth's atmosphere would remain about the same temperature as it is today.
 d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

In 1990s, less greenhouse gases... lets more heat escape... Cooler

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 b. Reflection of more solar radiation, causing atmospheric temperature to increase
 c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase \times
 d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease \times

Glaciers reflect... No rays absorbed... less infrared radiation. Temp. decreases

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature. \times
 b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature. \times
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification describes the process of how CO_2 causes the ocean to become more or less acidic. When carbon dioxide (CO_2) mixes with water, bicarbonate (HCO_3^-) and hydrogen (H^+) ions result. These bicarbonate ions can also break down further into more hydrogen (H^+) ions. The more hydrogen ions there are in the ocean, the higher the acidity (pH) and vice versa. An increase in CO_2 in the Earth's oceans will clearly result in a higher acidity and less CO_2 will cause lower acidity. A large imbalance in the oceans' acidity can hurt marine organisms that would need to form their shells/skeletons.

In this situation, an increase in atmospheric CO_2 can both further and dampen change in the ocean acidification process. The more obvious effect is that an increase in atmospheric CO_2 will cause more CO_2 to enter the oceans. The more CO_2 that is in the oceans, the more ocean acidification will take place and cause the ocean to become more and more acidic, thus resulting in positive feedback. However, if you think about it more deeply, more CO_2 in the air means higher temperatures due to the greenhouse effect. Higher temperatures causes the oceans' temperatures to increase as well. Warmer water holds less CO_2 , so in fact less ocean acidification should occur due to this. This is an example of negative feedback.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanism can both increase and decrease atmospheric temperatures. Because these volcanoes are erupting large ash clouds, there should be blockage of the sun's rays. These rays are visible light that mostly get absorbed by the Earth's surface before they are re-radiated as infrared rays. These rays are then absorbed by greenhouse gases and re-emitted back into the atmosphere. This explains how heat gets trapped in the Earth's atmosphere. Because the ash clouds block these rays, they will not be able to reach the Earth's surface and get converted into infrared rays (heat). Therefore, the ash clouds should cause temperature to decrease. Then again, volcanoes often emit incredible amounts of CO_2 into the Earth's atmosphere. CO_2 is one of the greenhouse gases that absorb and re-emit infrared (heat) waves back into our atmosphere, thus trapping heat. Thus, this should cause Earth's atmospheric temperature to increase.

When there is a lot of volcanism occurring, we expect to see an increase in temperature and CO_2 in the atmosphere, as well as more mountain building. At the same time there is an expectation that sea level is changing as well. One event occurring, such as volcanism, causes patterns in other Earth changes.

25

2 Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Evaporation and degassing both describe how water and CO_2 move from the oceans to the atmosphere. However evaporation includes the phase change of liquid water in the oceans to water vapor in the atmosphere. Degassing is how CO_2 gas in the oceans moves to CO_2 gas in the atmosphere.

No phase change

Earn up to 1 additional point on your course grade

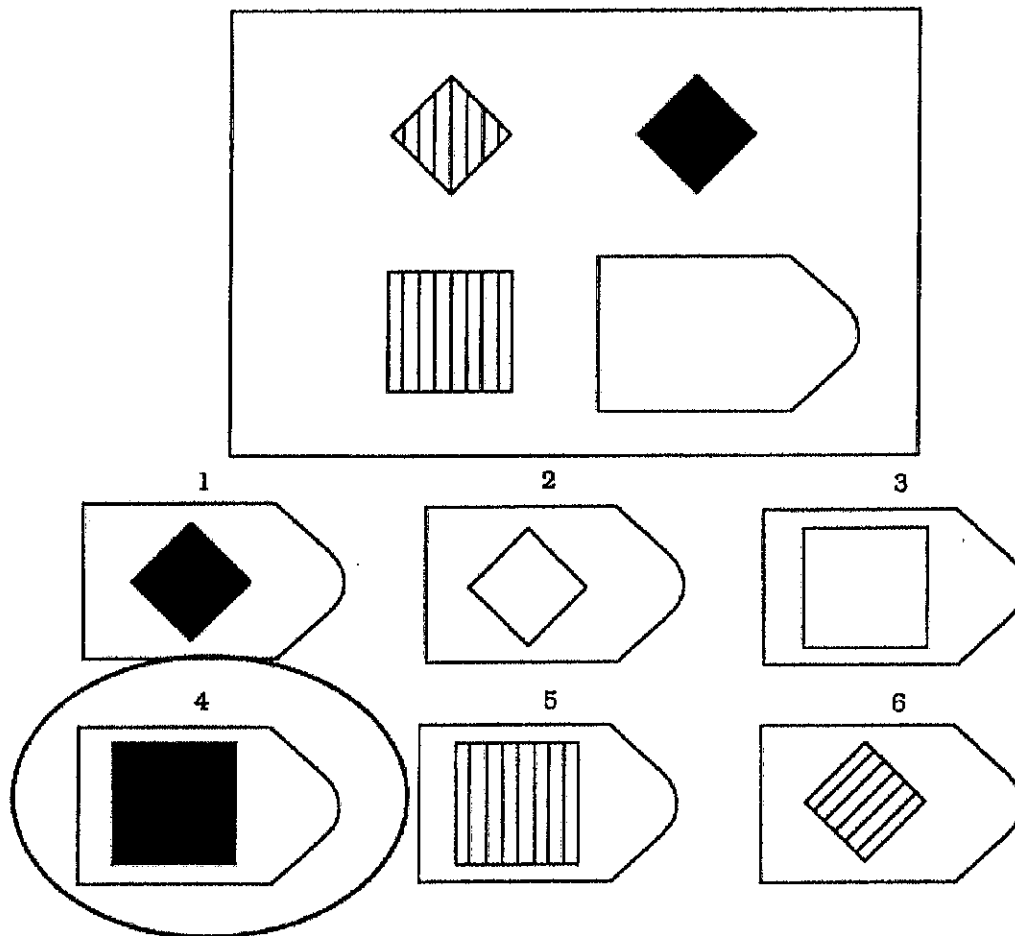
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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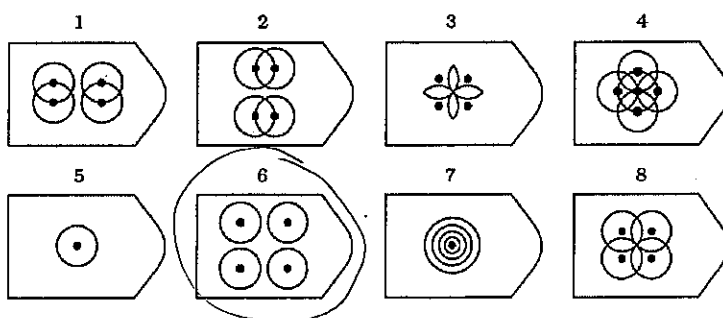
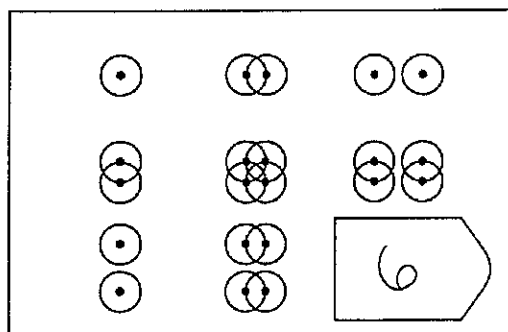


Answer: 4

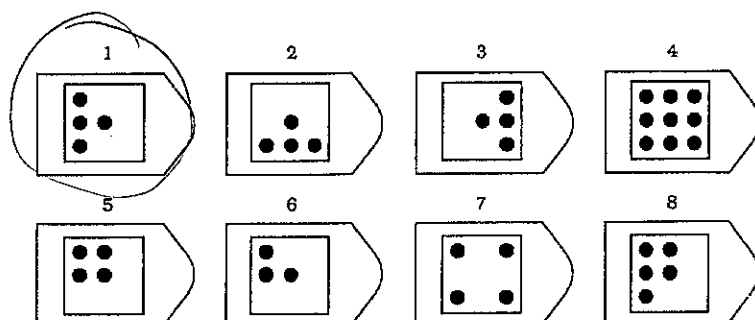
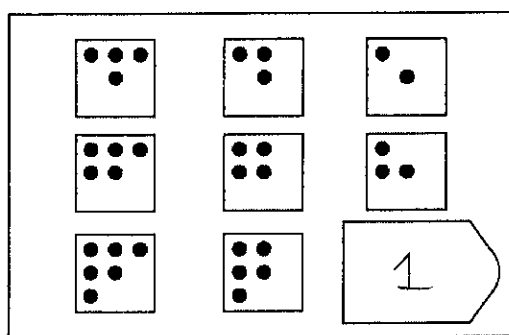
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

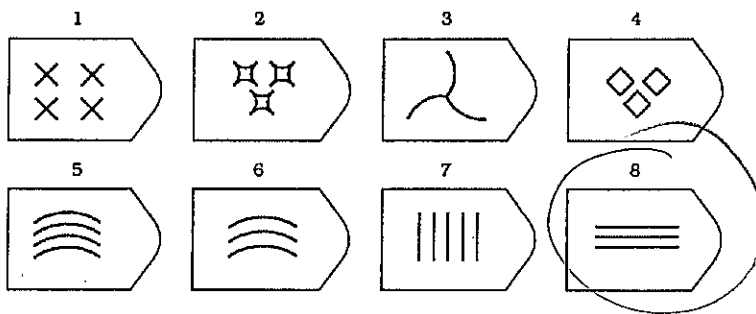
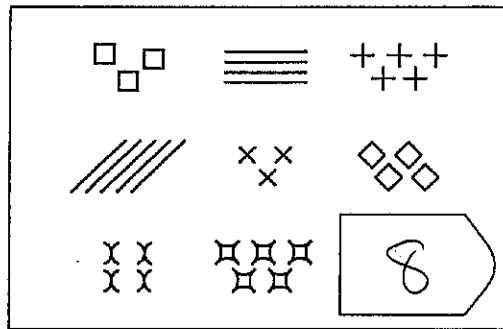
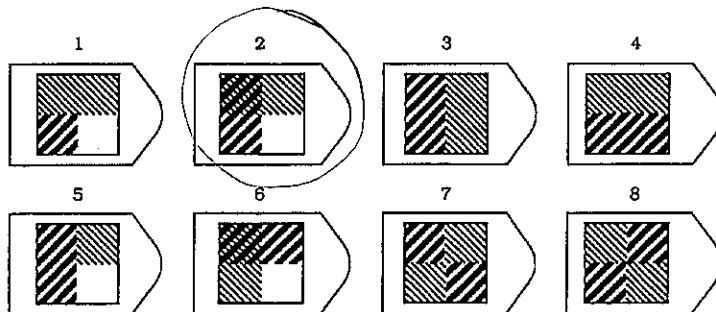
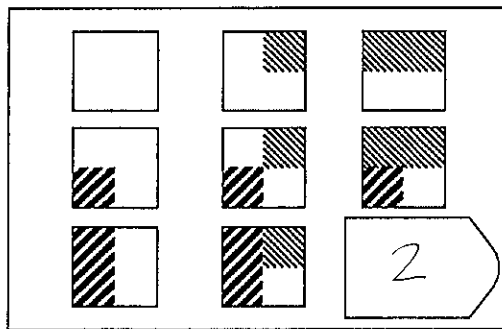
PATTERN 1

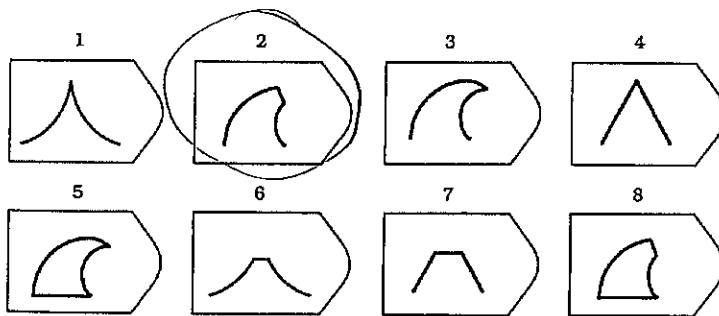
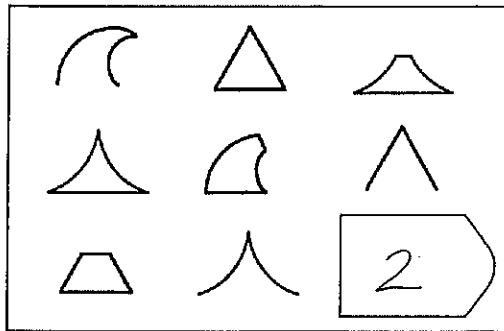


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

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C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.

C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

A. Getting high. They are both involve too much of a chemical influencing the body.

B. Hitting your head. They both involve something that causes headaches.

☒ C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

C. Clouds forming. They are similar because they both involve a phase change.

☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48363

What is your gender?

☒ Male

☐ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

1

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

STUDENT NAME: A39127449

GROUP: 5

18

Version B

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ☒ c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - ☒ a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☒ e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - ☒ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A. If CO_2 in the atmosphere is increased, this would increase CO_2 in the ocean. Once CO_2 enters the ocean it is combined with H_2O which creates biocarbonate and Hydrogen ions. Hydrogen ions is like Salt and will make the water Salty or acidity. 20

? So if there is more CO_2 in the atmosphere there is more CO_2 in the ocean which will create more biocarbonate & hydrogen ions which will make the ocean more acidity.

B. A negative feedback For this would be if CO_2 is increase in the atmosphere then temperature would increase. Also this would increase CO_2 in the ocean. If the temperature in the ocean is warm then there is less CO_2 and if there is more CO_2 the ocean is colder. (In this case there is more CO_2 in the ocean so its making the ocean colder.)?

A positive feedback for this would be if CO_2 is increased in this atmosphere the temperature would increase because

CO_2 acts like the green house effect and trap heat on Earth causing it to warm up.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

13 When volcanoes erupt and large ash clouds cover the atmosphere, this stops visible light from coming thru. This will then lower the temperature of Earth. But the greenhouse gas effect will continue and warm the Earth. The greenhouse gas effect is the process which heats the Earth using the Sun's energy. The energy from the Sun comes as visible light and easily passes through the atmosphere to Earth's surface. It will then reflect back to space without warming the Earth or will be absorbed and convert into infrared energy. This energy is then emitted to the atmosphere where the greenhouse gas absorbs it. When the greenhouse gas absorbs it, it becomes more energetic and emits infrared energy in all directions. This energy can then be absorbed by the surface again and be re-emitted back to the atmosphere from which the process will happen again. This will then trap the energy on Earth and cause it to warm up.

With the ash lowering the temperature and greenhouse gas increasing the temperature, it is unsure whether the temperature is increasing or decreasing.

P

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is liquid forming into gas and degassing is gas forming into liquid.

Earn up to 1 additional point on your course grade

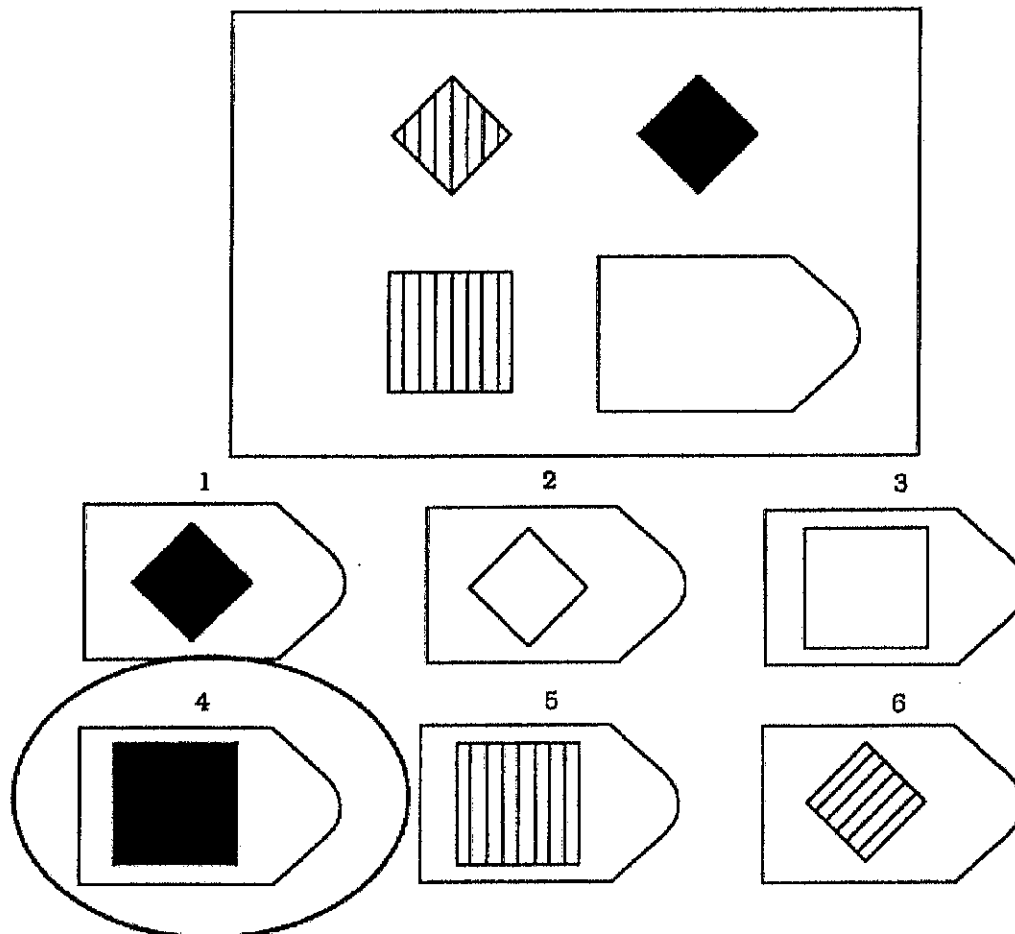
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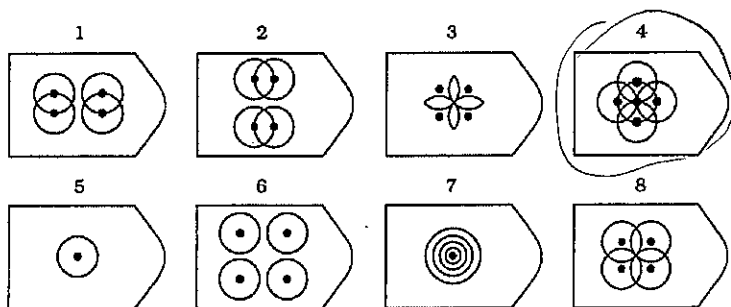
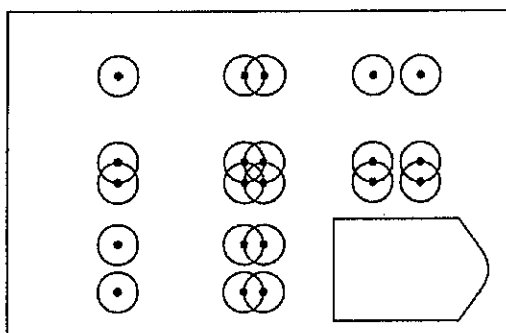


Answer: 4

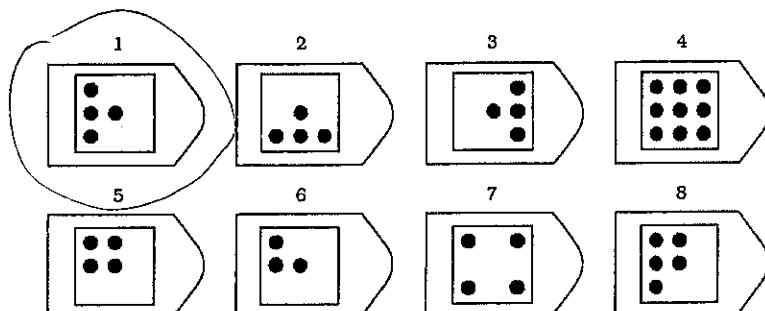
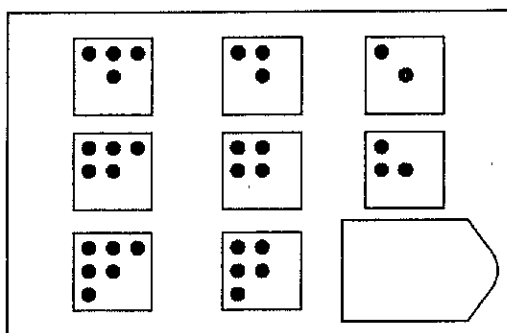
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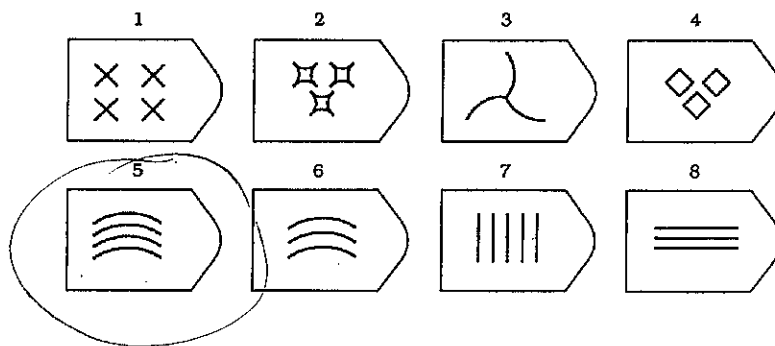
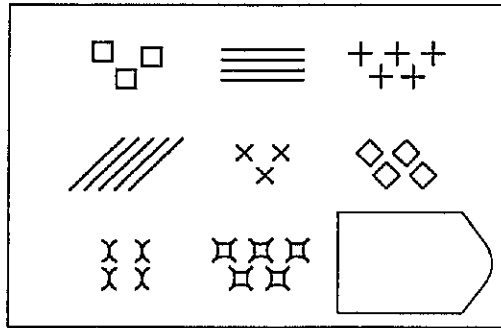
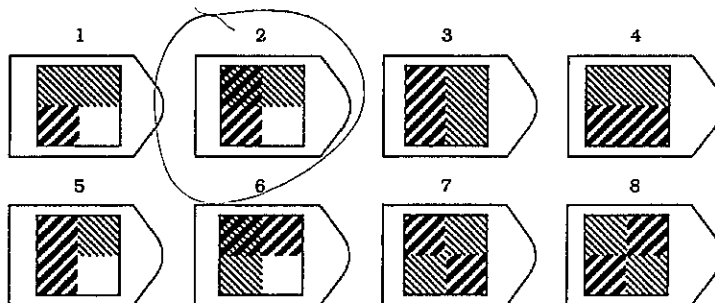
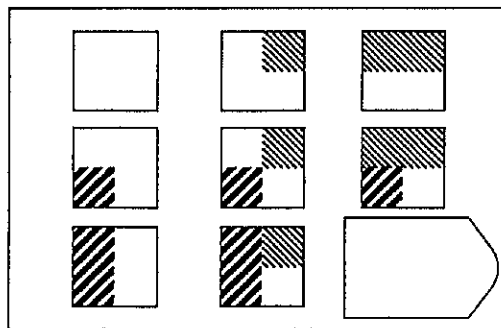
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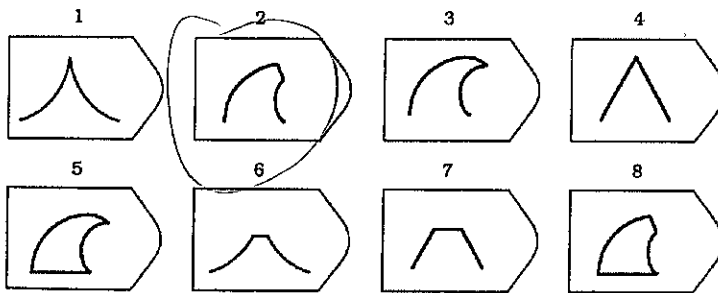
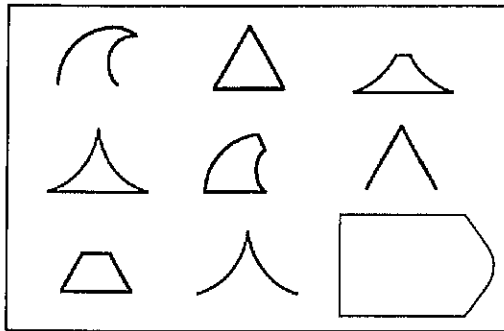
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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Please choose the response that is closest to an analogy that you might make.

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- A. Dew forming. They are similar because they both involve a drop in temperature.
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DEMOGRAPHICS

What is your age? 71 years

What is your home zip code? 48035

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☒ Other

STUDENT NAME: A43856550
Version B

GROUP: 5

87

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
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3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A=erosion, B= deposition, C= uplift and erosion
 - b. A=erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - ☒ a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

$$\begin{array}{r} 2000 \\ \times 500 \\ \hline 4 \end{array} \quad \begin{array}{r} 1000 \\ \times 500 \\ \hline 2 \end{array}$$

6. Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- ~~d. The reservoir's residence time is 10 years.~~



more in
less out
no residence
time

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

(S)

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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

3

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A) Ocean acidification: as carbon dioxide enters the oceans it bonds with ~~hydrogen~~ water. the hydrogen ions, is released, the amount of hydrogen ions in the ocean is the measure of acidity.

20

Positive Feedback: when a change occurs, another change occurs in the same direction.

as you increase the CO_2 in the atmosphere, the amount of carbon dioxide in the oceans increase. Increase in carbon dioxide in the oceans causes an increase in the acidity. while the process of ocean acidification occurs bicarbonate bonds with calcium to produce calcium carbonate, limestone. Soon the limestone will be eroded an increase the carbon dioxide in the atmosphere, causing a positive feedback loop.

Negative Feedback: when a change occurs, a reaction goes the opposite direction

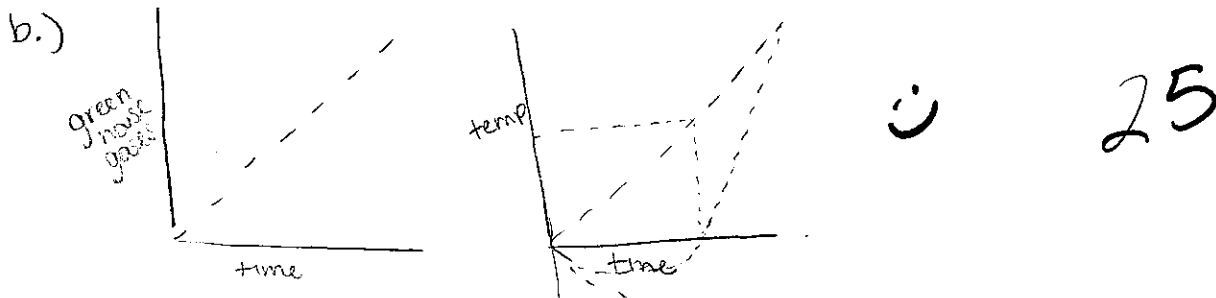
as the CO_2 in the atmosphere increases, the CO_2 in the ocean increases, which increases the process of ocean acidification while the acidification occurs carbon dioxide ~~gas~~ bonds with calcium which then forms limestone which is buried at the bottom of the ocean through burial. ?

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a) greenhouse effect: The Sun gives off visible light, the Earth's surface absorbs VL + converts it to infrared energy/heat. Earth's surface emits the infrared heat to the atmosphere, some is lost in space and some is absorbed by the greenhouse gases, the greenhouse gases then re-emit the infrared energy back to Earth's surface heating the temperature.



the sun gives off visible light, ash covering that atmosphere blocks the visible light from breaking through to the Earth's surface. with no visible light for the Earth to absorb, there would be no infrared heat for the greenhouse gases to absorb and re-emit to the Earth's surface. The temperature of Earth's atmosphere would decrease significantly. the greenhouse gases are still increasing at a steady rate, and are not being used. As the ash disappears the visible light can reach Earth's surface to be emitted as infrared heat and be absorbed and re-emitted by the greenhouse gases giving an increase to our atmospheric temperature! Yes!

2

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the process of changing a liquid to a gas

as degassing is moving a gas from water to air with no change in the concentration

(S)

A43856550

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

5

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

(S)

A43856550

Form B

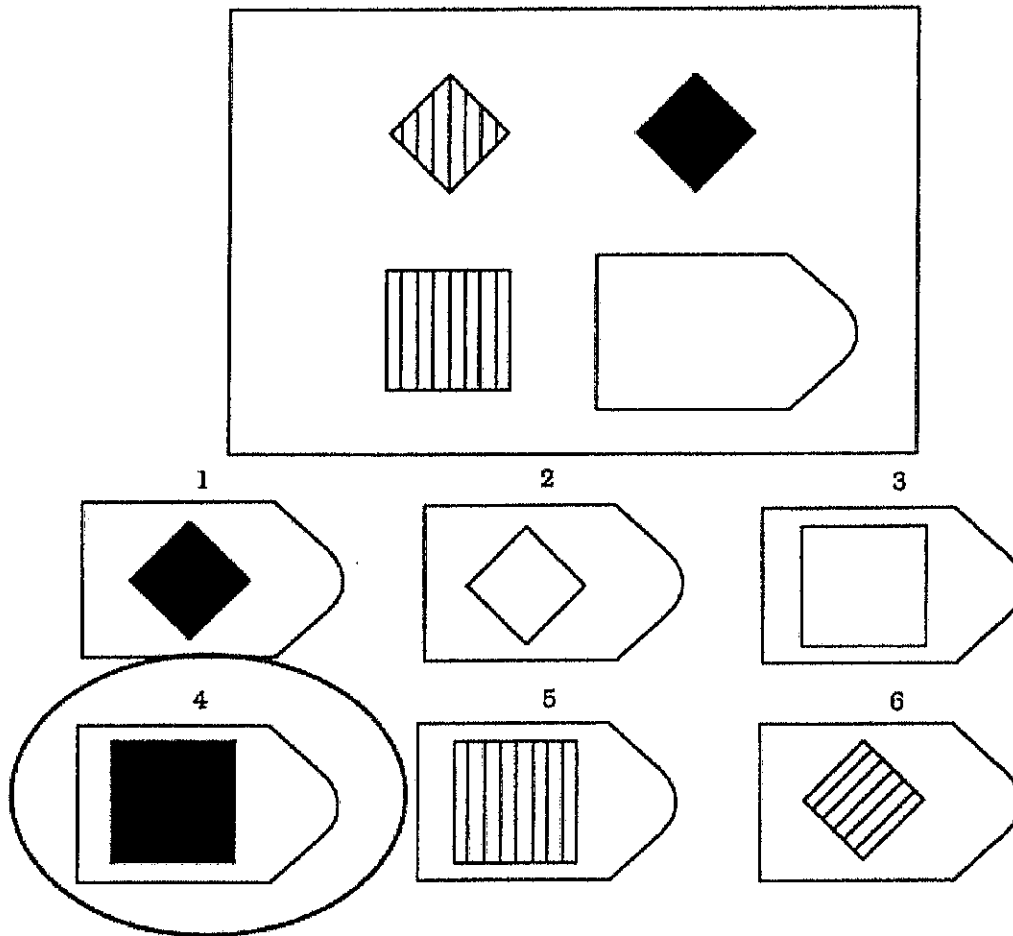
Test 1

Student ID _____

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

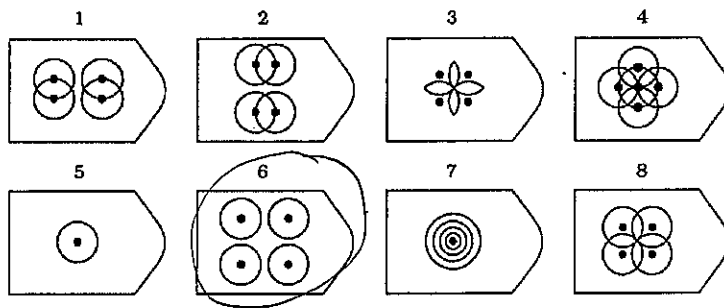
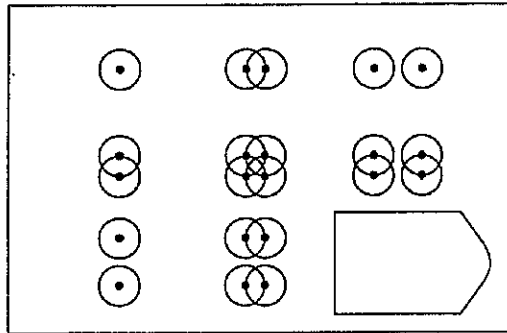


Answer: 4

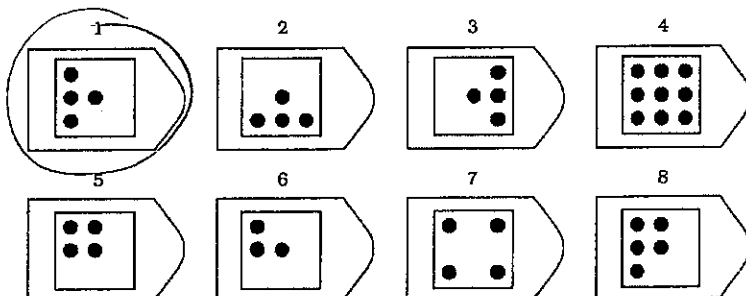
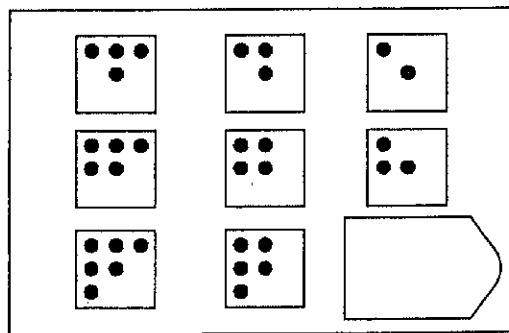
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1



PATTERN 2



(S)

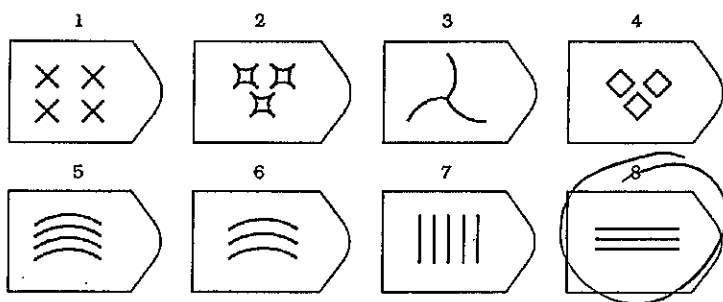
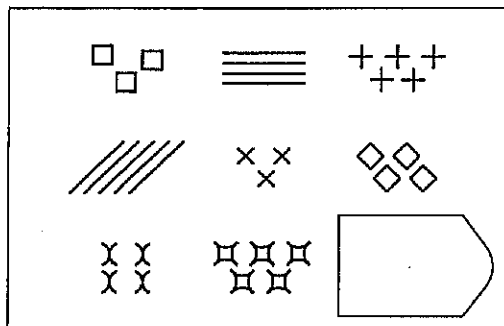
A 43856550

Form B

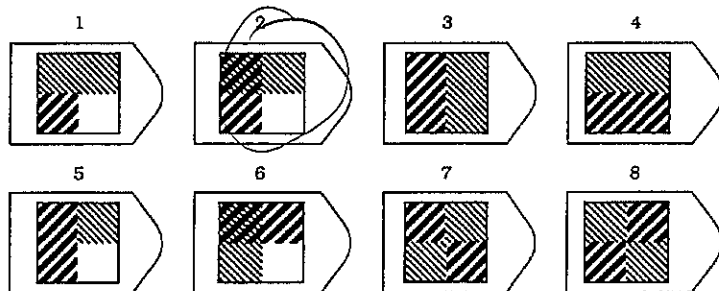
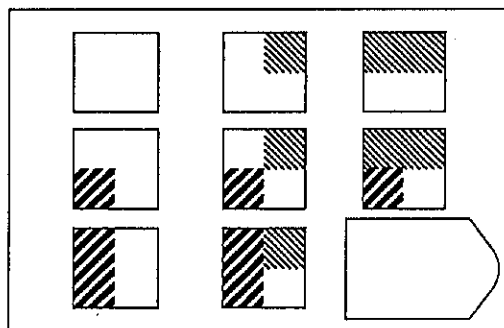
Test 1

Student ID _____

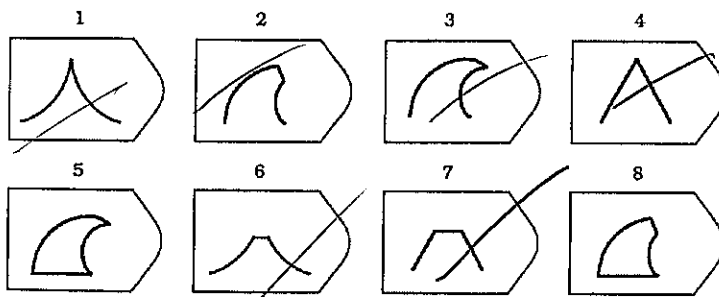
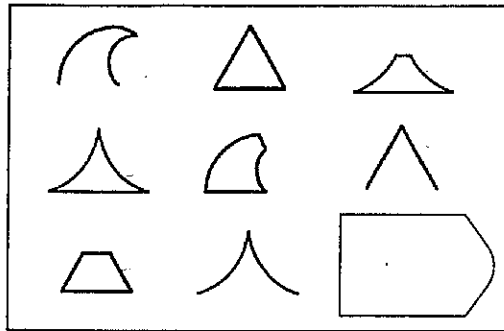
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

(S)

A43856550

Form B

Test 1

Student ID _____

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

☒ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

☒ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

☒ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

☒ C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

☒ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.

☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

C. Once he saw everyone else's formal suits, Dan went home to change clothes.

☒ D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- ☐ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- ☐ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- ☐ D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48334

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A3 973 7915
Version A

GROUP: T

97

MULTIPLE-CHOICE. 5 points each (50 points total).
write letter!

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- b*
- ☐ a. The magma becoming colder
 - ☒ *b* b. Gas bubbles forming in the magma *5*
 - ☐ c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
solidifying → decrease rate

b 2. Which of the following would be considered a negative feedback to increasing global temperature?

- ☒ *a* a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed (*vis. not infrared*)
- ☒ *b* b. Melting of permafrost resulting in more methane escaping into the atmosphere
- ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
- ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

C 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A = erosion, B = deposition, C = uplift and erosion
- b. A = erosion, B = biochemical precipitation, C = uplift and deposition
- ☒ *c* c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
- d. A = dissolution, B = deposition, C = uplift and deposition

b 4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☒ *a* a. Human activities are the primary cause of the greenhouse effect.
- ☒ *b* b. Natural processes are the primary cause of the greenhouse effect.
- ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
- ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
- ☐ e. The human and natural causes of the greenhouse effect are not understood.

ack 5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ *a* a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
- ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
- ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

b 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
- ☒ *b* b. Reservoir B has a shorter residence time than Reservoir A.
- ☐ c. Reservoir A and Reservoir B have equal residence times.
- ☐ d. More information about Reservoir A and Reservoir B is needed.

influx *outflow*

A	1000	100	100
B	500	100	100

$$\frac{1000}{200} = 5 = r + (A)$$

$$\frac{500}{200} = 2.5 = r + (B)$$

A39737915

2

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

- b 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- ~~a. The reservoir will eventually disappear.~~
 - ☒ b. The reservoir is not in equilibrium.
 - ~~c. The reservoir is growing smaller.~~
 - ~~d. The reservoir's residence time is 10 years.~~
- a 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ~~a. Reflection of more solar radiation, causing atmospheric temperature to decrease~~
 - ~~b. Reflection of more solar radiation, causing atmospheric temperature to increase~~
 - ~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- b 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ~~c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.~~
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- b 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ~~a. The Earth's atmosphere would become colder than it is today.~~
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

increase in CO_2 ?

✓

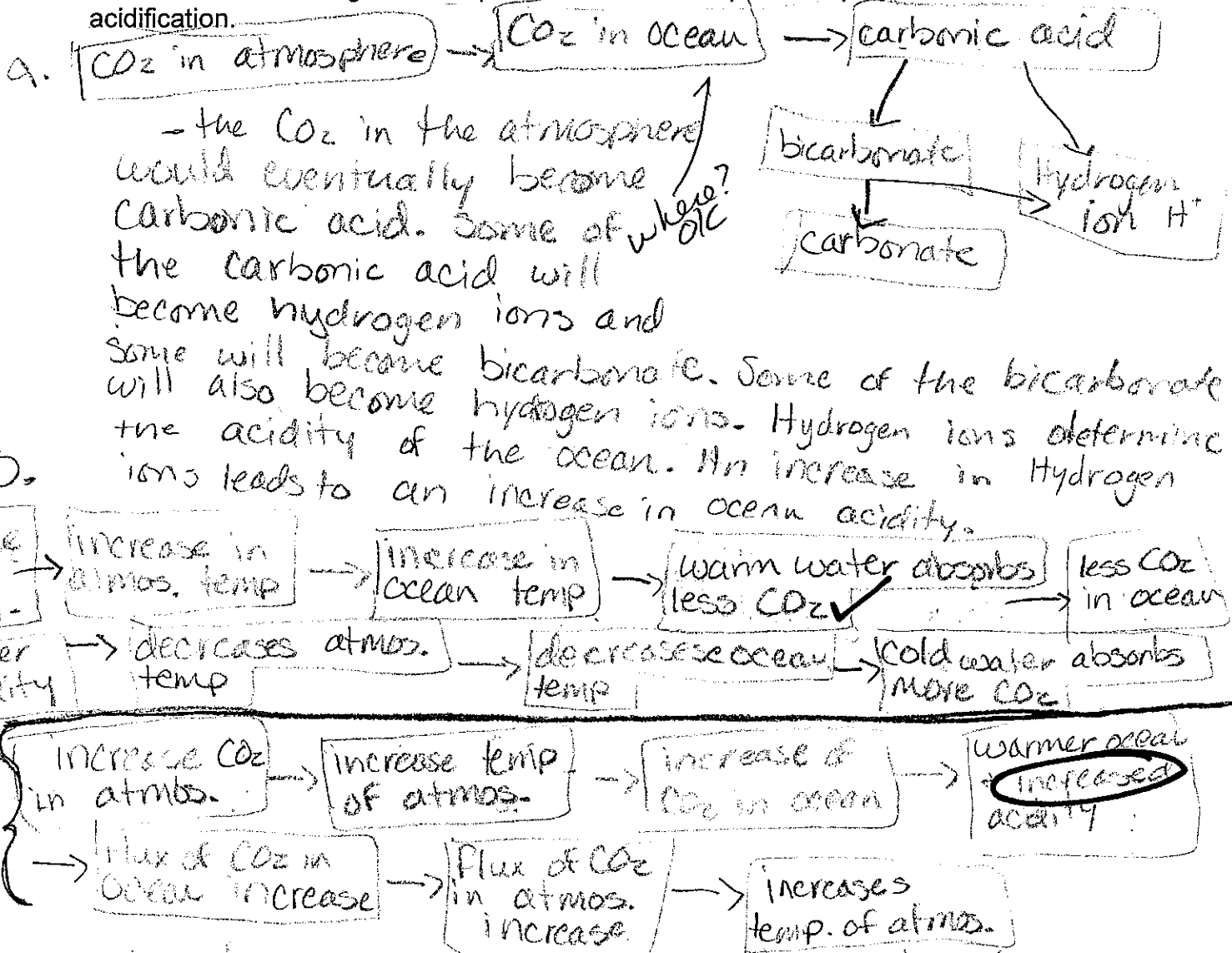
SHORT ANSWER. 25 points each (50 points total)

24

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- a. An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- b. Discussion of both negative and positive feedback loops to the process of ocean acidification.



An increase in atmospheric carbon dioxide would lead to an increase in oceanic carbon dioxide, which would cause an increase of hydrogen in ocean, raising the acidity. The CO_2 in the atmosphere would increase because of the increase of CO_2 in the hydrosphere, biosphere, + lithosphere. This is positive feedback.

An increase of CO_2 in atmosphere would increase the temperature of the atmosphere, which would increase the temperature in the ocean. The warm water cannot absorb as much CO_2 , decreasing acidity. \rightarrow

The CO₂ in the atmosphere ~~will increase~~ due to the decrease of CO₂ in the hydrosphere, biosphere, + lithosphere. This is negative feedback. 4

ISP 203A: GLOBAL CHANGE

FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

DJ
continued

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

A39737915

Your answer should include:

- a. An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
b. Clear connections between events and changes in atmospheric temperature.

25

a. Volcanoes erupt when magma forms and reaches the earth's surface. This occurs at subduction zones when magma forms and is less dense than the surrounding rock. The greenhouse effect will influence the atmospheric temperature. There are three greenhouse gases: methane, water vapor, + carbon dioxide which absorb infrared energy. The energy from the sun is mostly visible energy and passes through the atmosphere. Once it reaches Earth's surface, this energy is either reflected or absorbed, converted, + re-emitted into the atmosphere as infrared energy (heat). The greenhouse gases are able to absorb the infrared energy that they come in contact with and re-emit it in all directions. Some of the infrared energy is re-emitted to Earth which will then reflect it or absorb + re-emit it. The greenhouse effect warms the Earth keeping the temperature consistently sustainable of Earth's organisms.

b. As volcanism increases, ash clouds surrounding Earth will form and serve as a barrier between Earth and the Sun. The visible energy from the sun will not penetrate through the ash and will be reflected - lost to space. The ash will also block some of the infrared energy from escaping Earth's atmosphere. This energy will be "trapped" between Earth and the ashes. It will be re-emitted back and forth, warming the Earth. However, some infrared heat will consistently be lost, causing a cooling of the atmospheric temperature. Once the ash clears, the atmospheric temperature will exponentially increase, because the visible energy will finally reach the Earth's surface again where it will be reflected or absorbed, converted, + re-emitted - trapped.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the process by which liquid is turned into a gas.

2 degassing is the process by which gas in liquid bubbles becomes gas in the atmosphere.

Earn up to 1 additional point on your course grade

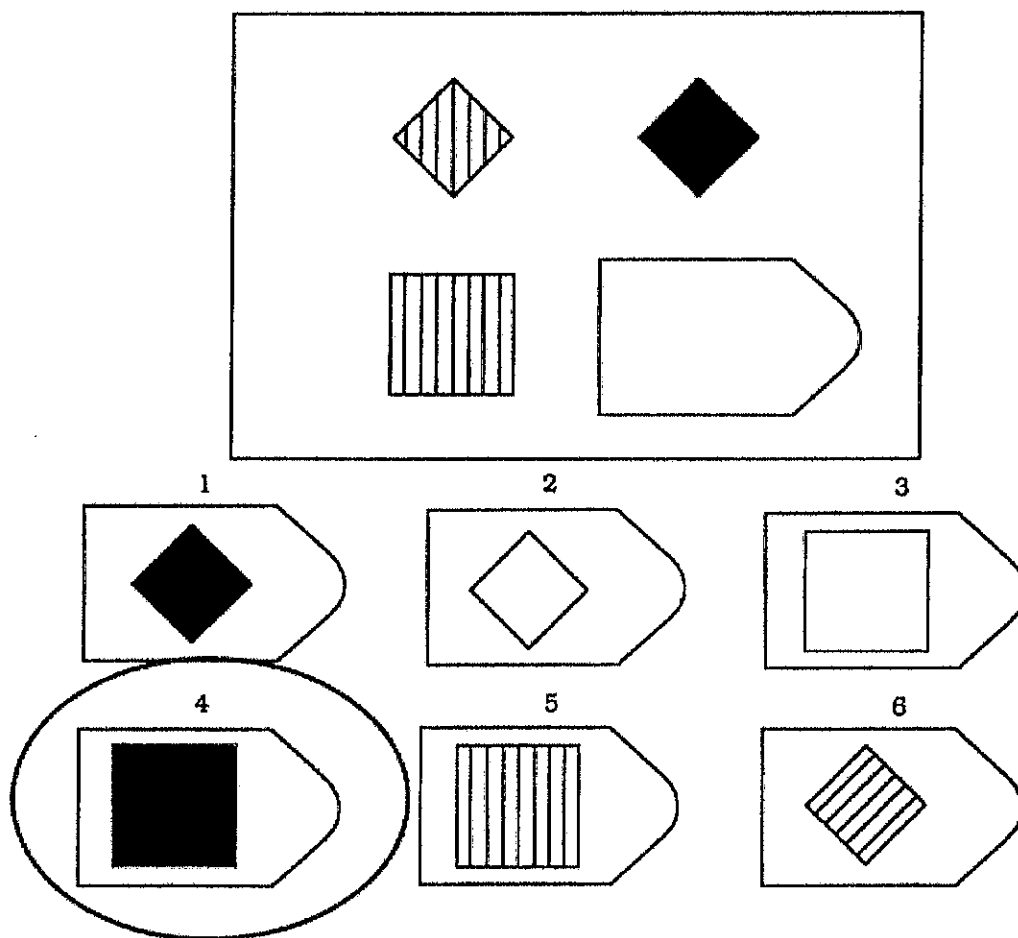
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

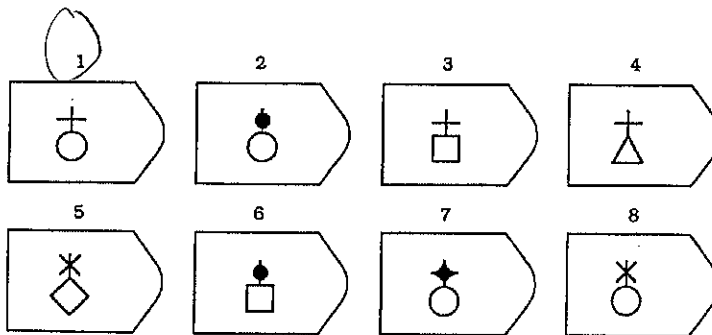
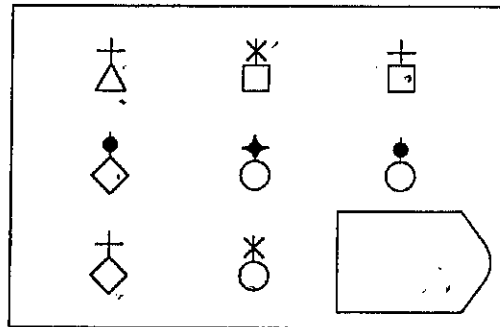


Answer: 4

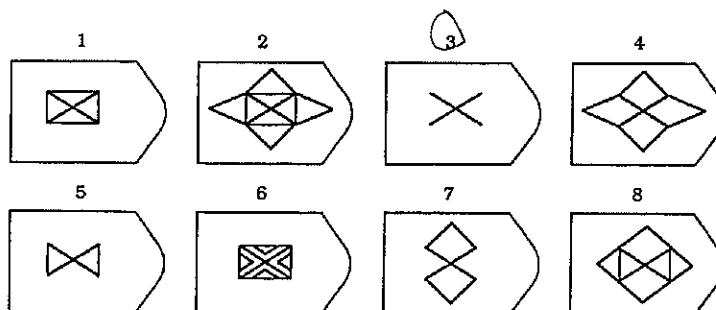
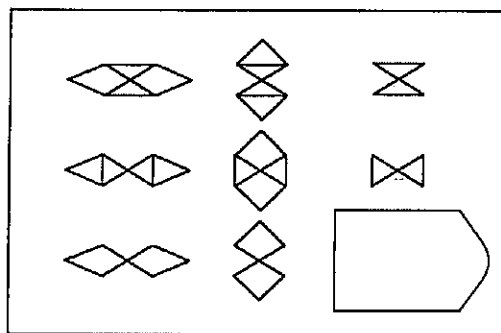
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Please choose the image that best completes each of the following patterns.

PATTERN 1

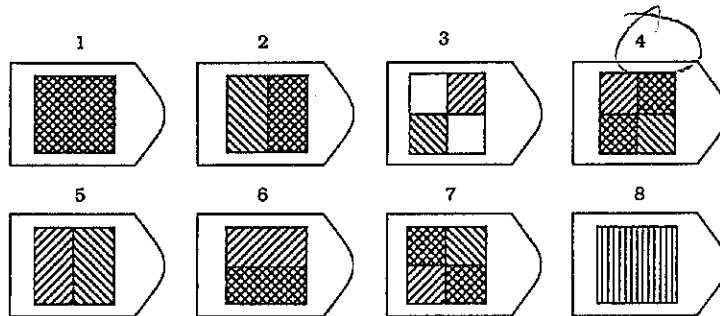
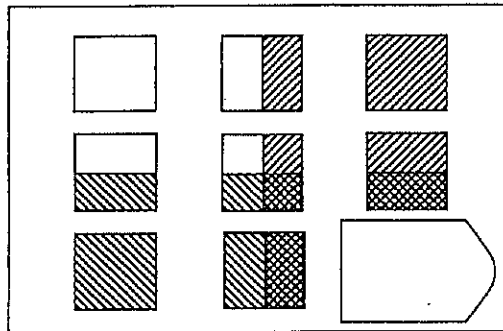


PATTERN 2

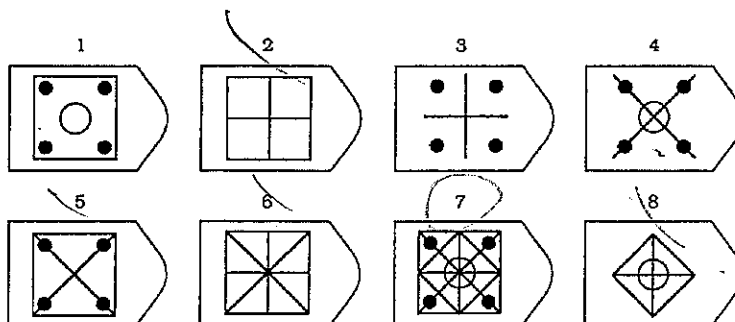
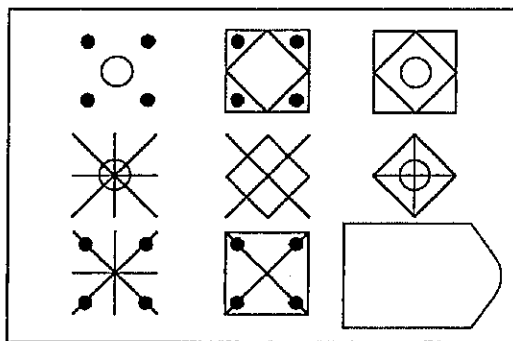


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PATTERN 3

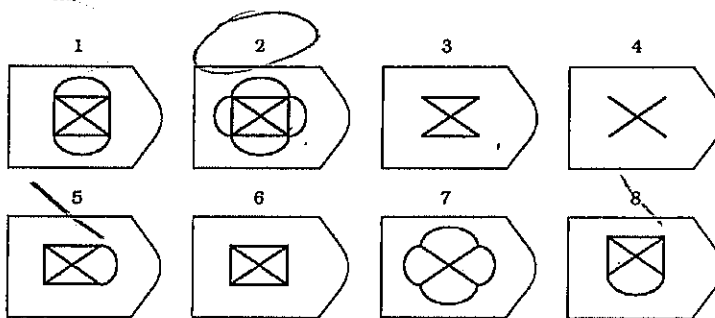
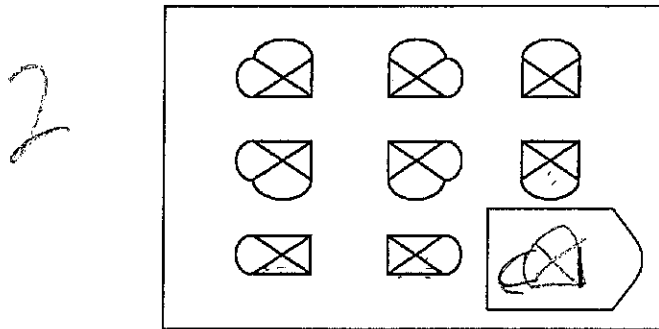


PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

C 1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

~~A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.~~

~~B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.~~

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

~~D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.~~

D 2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

A 3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

~~B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.~~

~~C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.~~

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

C 4. The rival gangs used graffiti to define their territorial boundaries.

~~A. The toddler wrote on the walls with pens when the babysitter wasn't looking.~~

~~B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.~~

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

*I was at office hours before the exam!

Form A

Test 1

Student ID A3973795

- D 5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- ~~A. The plumber fixed the pump that had burst and flooded the basement.~~
 - ~~B. Steven avoided midweek outings in order to have the time for a weekend trip out of town~~
 - ~~C. The groom's mother mended her son's tuxedo since he had torn a hole in it.~~
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.

Please choose the response that is closest to an analogy that you might make.

X 1. A balloon floating is like...

- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- ~~B. A leaf in the air. They are similar because they both move through the air carried by the wind.~~
- ~~C. Blowing bubbles. They are similar because they both float until they eventually pop.~~
- ~~D. A cloud in the sky. They are similar because they both float and are carried by the wind.~~

A 2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 49821

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

*I was at office hours before exam
*Also → again just want to make sure to receive credit for 1st hw

STUDENT NAME: A39743811

GROUP: T

53

Version A

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- D
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature?

- A
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ~~b. Melting of permafrost resulting in more methane escaping into the atmosphere~~
 - ~~c. An increase in evaporation and cloud formation resulting in the release of latent heat~~
 - ~~d. An increase in desert formation resulting in more dusting blowing into the atmosphere~~

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- C
- ~~a. A= erosion, B= deposition, C= uplift and erosion~~
 - ~~b. A= erosion, B= biochemical precipitation, C= uplift and deposition~~
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ~~d. A= dissolution, B= deposition, C= uplift and deposition~~

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- C
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ~~d. Neither human activities nor natural processes are important causes of the greenhouse effect.~~
 - ~~e. The human and natural causes of the greenhouse effect are not understood.~~

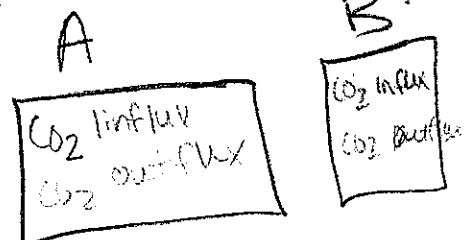
5. Which of the following would cause the acidity of Earth's oceans to decrease?

- A
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ~~b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.~~
 - ~~c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.~~

colder water holds more CO₂

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- B
- ~~a. Reservoir A has a shorter residence time than Reservoir B.~~
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - ~~c. Reservoir A and Reservoir B have equal residence times.~~
 - ~~d. More information about Reservoir A and Reservoir B is needed.~~



I was in your office before the exam

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

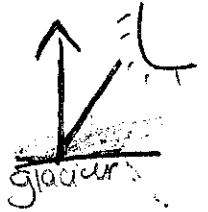
- ~~a. The reservoir will eventually disappear.~~
~~b. The reservoir is not in equilibrium.~~
~~c. The reservoir is growing smaller.~~
~~d. The reservoir's residence time is 10 years.~~

Reservoir influx outflow
1000 100 50
10

150 → 50
more is going out

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ~~a. Reflection of more solar radiation, causing atmospheric temperature to decrease.~~
~~b. Reflection of more solar radiation, causing atmospheric temperature to increase.~~
~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase.~~
~~d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease.~~



9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
~~b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.~~
~~c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.~~
d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ~~a. The Earth's atmosphere would become colder than it is today.~~
~~b. The Earth's atmosphere would become warmer than it is today.~~
~~c. The Earth's atmosphere would remain about the same temperature as it is today.~~
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

25

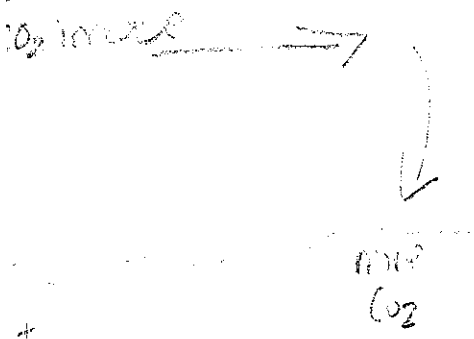
Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean Acidification is when CO_2 & Water (H_2O) combine to make bicarbonate. (There is an increase in temperature due to CO_2 in the atmosphere) the ocean then absorbs some of the CO_2 & Ocean acidification takes place. Hydrogen is a result of the H_2O & CO_2 combining the more concentrated the Hydrogen the more acidic the ocean will be & the lower the P.H. The colder the water the more carbon it can hold. ✓

If there is an increase in Atmospheric CO_2 there will be more CO_2 absorbed by the ocean this causes an increase in CO_2 in the ocean which is a positive feedback loop because carbon is increasing at the beginning & at the end not trying to reach equilibrium.

if there is an increase in carbon in the atmosphere then there is more CO_2 due to an increase in temperature if more CO_2 is being absorbed the the water temp is decreasing because colder water holds more CO_2 causing a negative feedback loop and reaching equilibrium

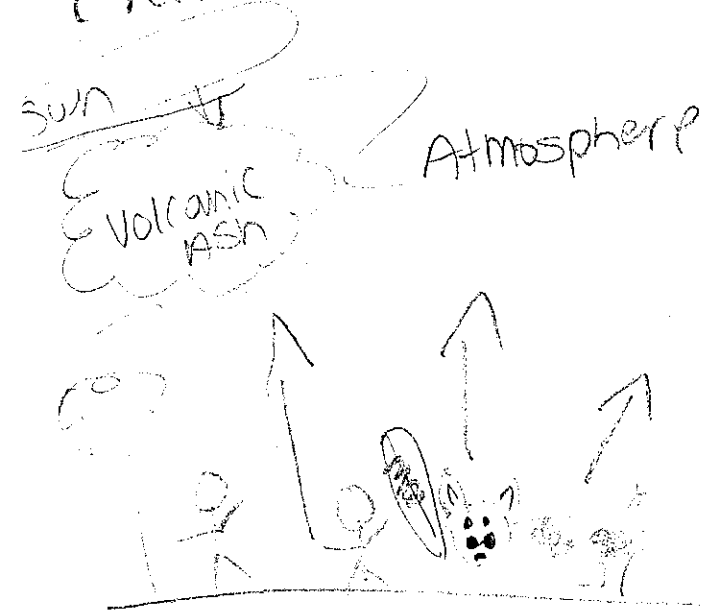


2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

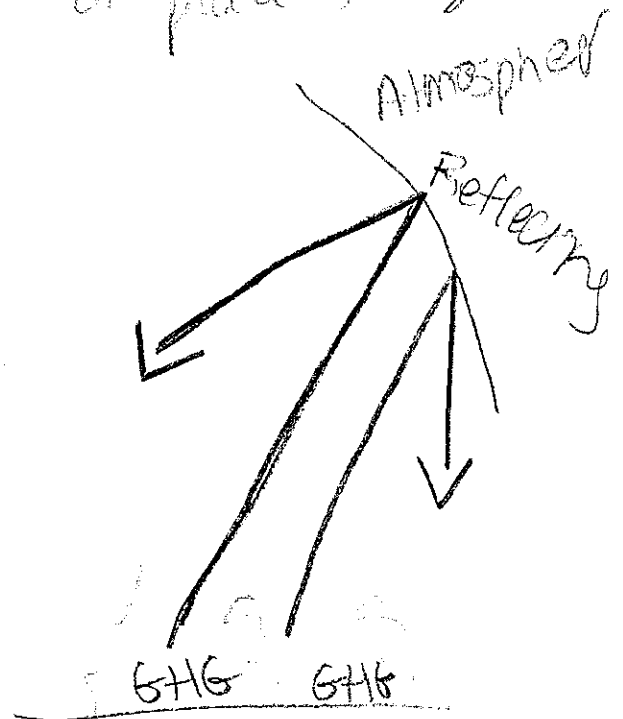
Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect is when greenhouse gases are released into the atmosphere. The greenhouse gases reflect back & cause the earth to warm. When a volcano erupts the ash can block the sun not allowing the gases to reflect but they are still there. Because all the people, animals, & organisms are still creating the greenhouse gases. Once the ash dissipates the earth's temperature will increase drastically because the gases now have a place to go & reflect.



1



Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is when something is going from a liquid to gas. & degassing is when the gas is being released from a liquid or solid.

Earn up to 1 additional point on your course grade

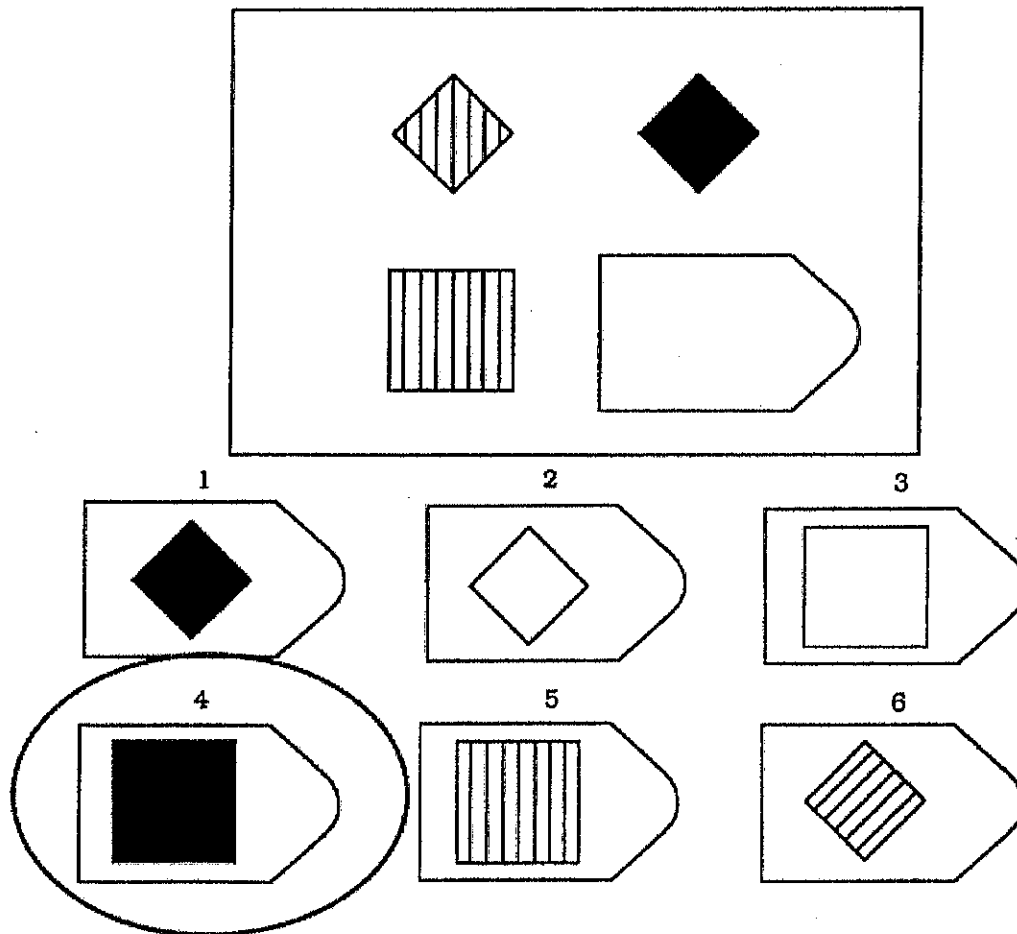
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

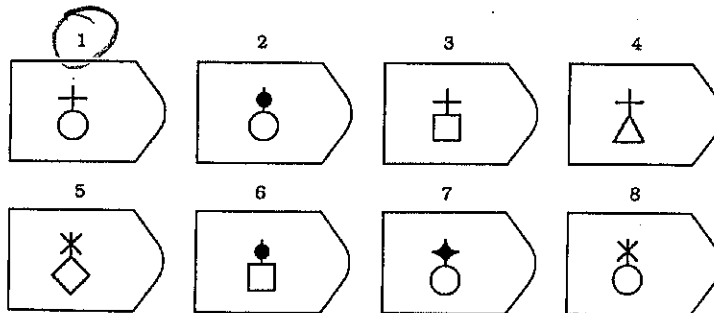
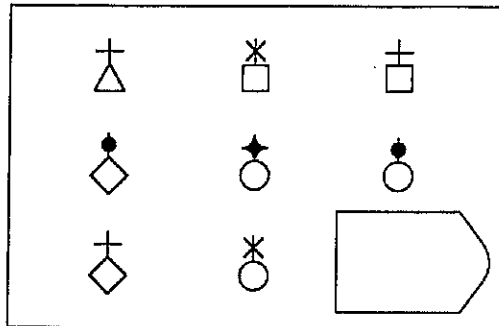


Answer: 4

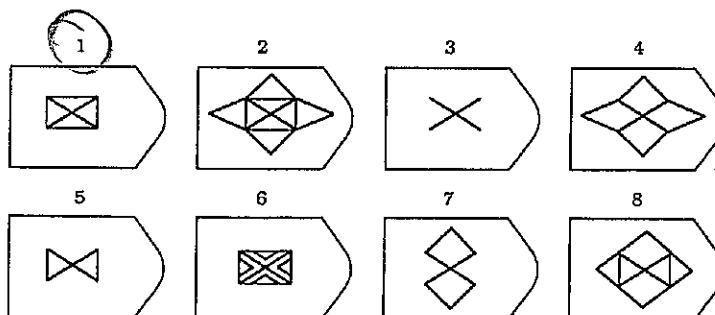
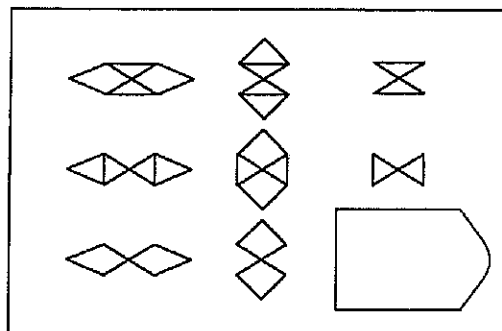
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Please choose the image that best completes each of the following patterns.

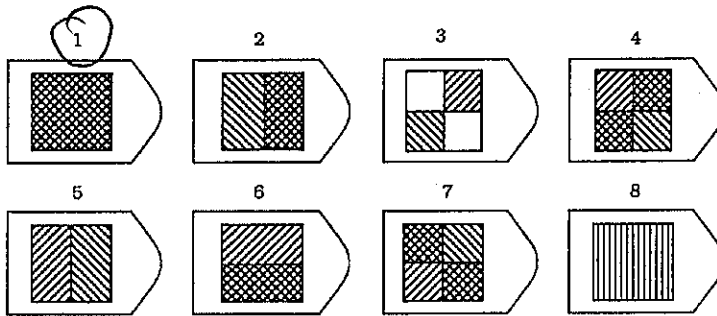
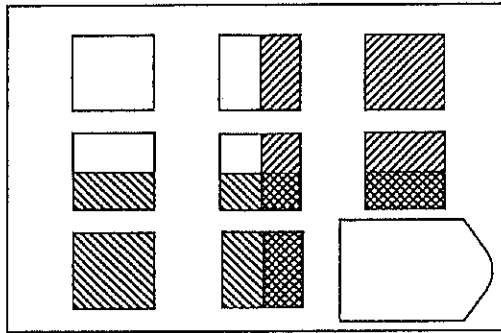
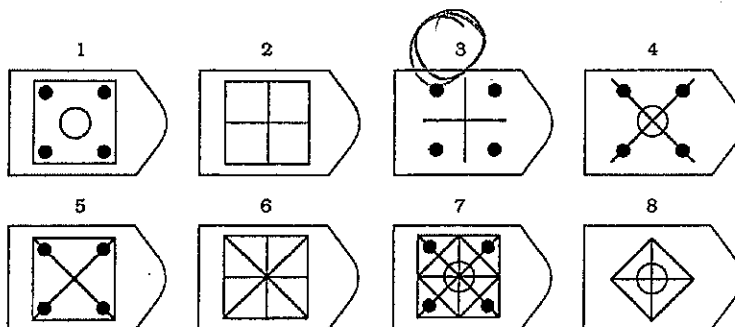
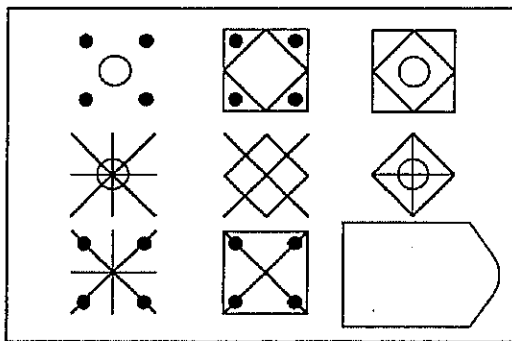
PATTERN 1



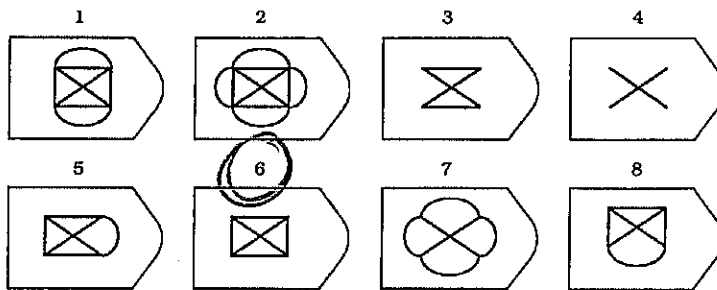
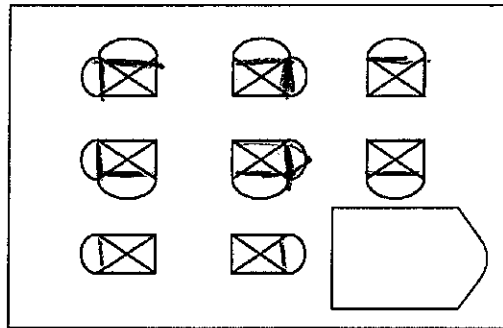
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

~~A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.~~

B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

~~A. Before the annual parade, the city council decided to renovate one of the buildings downtown.~~

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

~~C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.~~

D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

~~B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.~~

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

~~A. The toddler wrote on the walls with pens when the babysitter wasn't looking.~~

~~B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.~~

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- ~~A. The plumber fixed the pump that had burst and flooded the basement.~~
- ~~B. Steven avoided midweek outings in order to have the time for a weekend trip out of town.~~
- C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
- ~~D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.~~

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- ~~B. A leaf in the air. They are similar because they both move through the air carried by the wind.~~
- ~~C. Blowing bubbles. They are similar because they both float until they eventually pop.~~
- ~~D. A cloud in the sky. They are similar because they both float and are carried by the wind.~~

2. Catching a cold is like...

- ~~A. Getting the flu. They are similar because they are both caused by viruses.~~
- ~~B. Getting pink eye. They are similar because they are both contagious.~~
- ~~C. Getting the flu. They are similar because they are both caused by not washing your hands.~~
- ~~D. Forgetting to do your homework. They are similar because they are both preventable.~~
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 49812

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian White
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

I was in your office
before the exam

STUDENT NAME: A44013916
Version A

GROUP: T

50

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
B ☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
B ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
C ☐ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
☐ d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
C ☒ a. Human activities are the primary cause of the greenhouse effect.
☐ b. Natural processes are the primary cause of the greenhouse effect.
☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☐ e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
B ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
C ☐ a. Reservoir A has a shorter residence time than Reservoir B.
☐ b. Reservoir B has a shorter residence time than Reservoir A.
☒ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

☒ 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- C
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☒ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

☒ 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- C
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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☒ 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- D
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

If atmospheric CO_2 increased, the CO_2 in the atmosphere would also increase in the oceans. This would cause the pH of the ocean to also increase. The CO_2 would then be re-emitted into the atmosphere also. (Which makes this a positive feedback).

4?

15

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

20

With large ash clouds, it would block the radiation & energy the sun gives. Therefore, the atmospheric temperature would decrease. Not much visible light would be transmitted onto the Earth's surface. So, less infrared, or heat, energy would get absorbed by the Earth's surface, and the greenhouse gases (which are great IR absorbers) would absorb less IR energy and re-emit less IR energy. This all leads to a decrease in temperature. Because, usually the sun radiates visible light which does not get absorbed by the atmosphere but by the Earth's surface. It then becomes infrared energy, which greenhouse gases absorb, but some of the IR energy escapes into space (does not heat the atmosphere as it escapes). The greenhouse gases then emit the IR energy in all directions, & some escapes to space while the rest gets absorbed by Earth's surface. That IR energy left then gets re-absorbed by G.G., hence the heat getting "trapped". But, since there is very little sun radiation there is not much heat getting trapped, therefore a decrease in temperature.

* I'm hoping to pass this class because science is not my best subject. I feel have learned stuff that is new to me in this class but probably not as much as you expected. I have attended almost all my classes too. Hopefully this plea might help you when inputting my grade. Thank you for such a good class!! ☺

Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

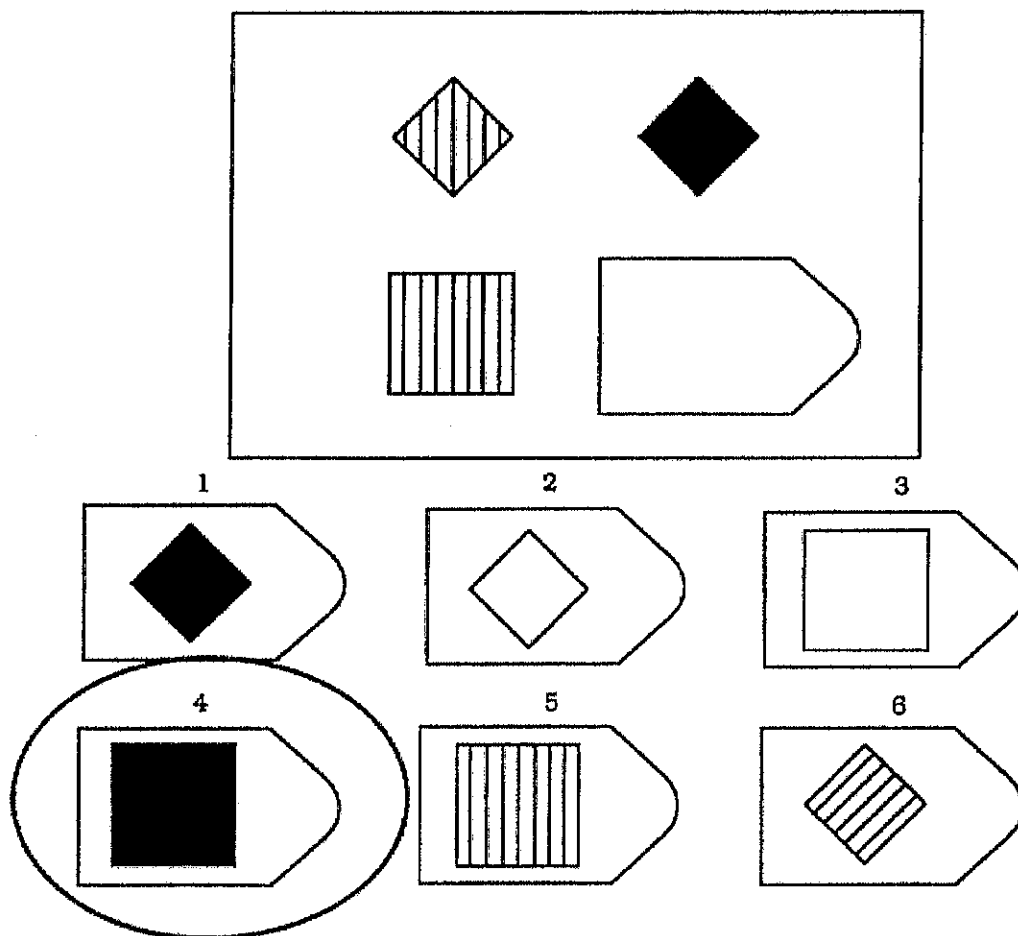
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

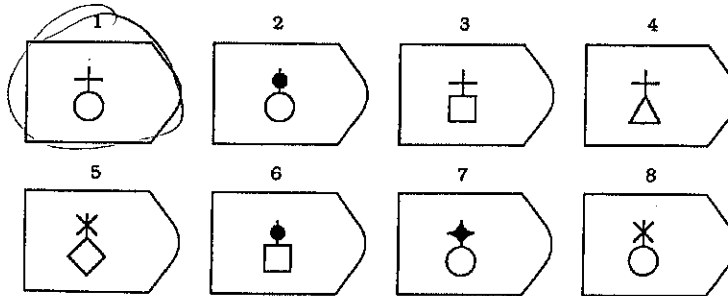
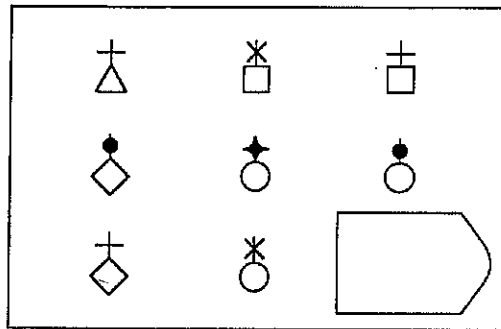


Answer: 4

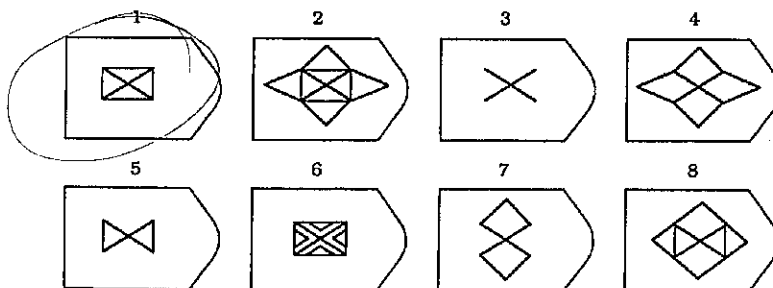
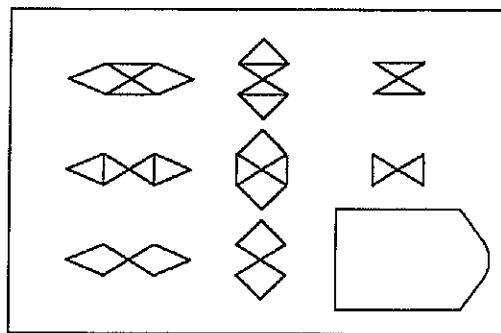
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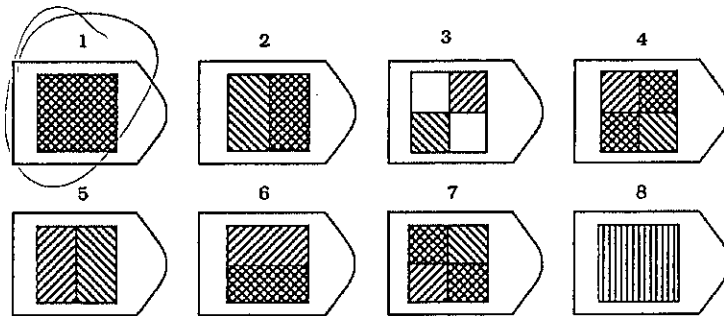
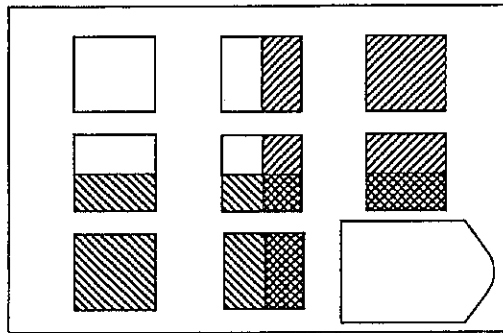
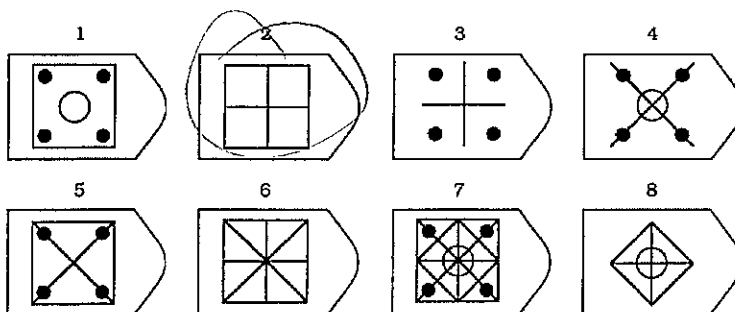
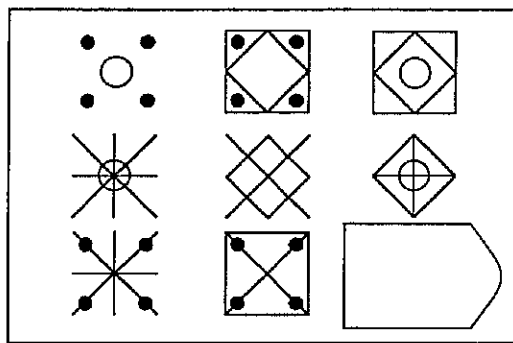
PATTERN 1



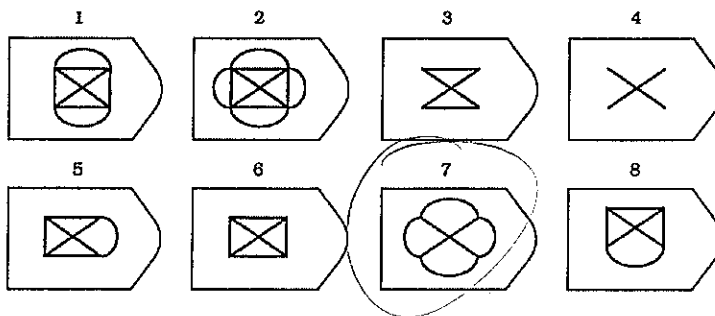
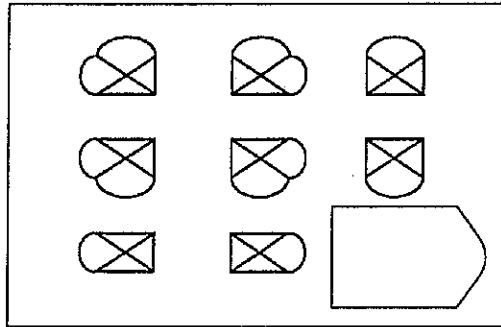
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - ☒ B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48331

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☐ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☒ Other

STUDENT NAME: A42185423
Version A

GROUP: T

70

MULTIPLE-CHOICE. 5 points each (50 points total).

- ☒ 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ☐ a. The magma becoming colder
 - ☐ b. Gas bubbles forming in the magma
 - ☐ c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
- ☒ 2. Which of the following would be considered a negative feedback to increasing global temperature?
- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere ↑ ↓ 0.7°C
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- ☒ 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☐ a. A= erosion, B= deposition, C= uplift and erosion
 - ☐ b. A= erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☐ d. A= dissolution, B= deposition, C= uplift and deposition
- ☒ 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect. ✓
 - ☐ b. Natural processes are the primary cause of the greenhouse effect.
 - ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
- ☒ 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide. Colder min hold more?
 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- ☒ 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☐ b. Reservoir B has a shorter residence time than Reservoir A.
 - ☒ c. Reservoir A and Reservoir B have equal residence times.
 - ☐ d. More information about Reservoir A and Reservoir B is needed.
- * A and B are the same = equal.
- Both are in equilibrium?
- Same inflow & outflow

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

Size	influx	outflow
1000	100	50

- a. The reservoir will eventually disappear.
- b. The reservoir is not in equilibrium. ✓
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

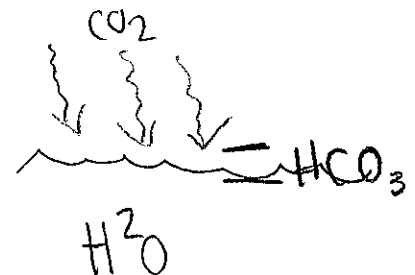
1. How would an increase in atmospheric carbon dioxide affect ocean acidification?
CO₂

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

- Ocean acidification is when CO₂ combines with H₂O creating the acidity in ocean waters. CO₂ is gathered in the atmosphere and combined with the water from the ocean. Since cooler, less dense water can hold more CO₂, an increase in cloud formation would lead to cooler temps in the ocean and higher levels of acidity. That is an example of a positive feedback because the cause creates an outcome in the same direction. If temperatures were to rise immensely then the ocean temps would warm up as well. This in turn would create less CO₂ because the water is unable to hold as much since it is less dense than before (due to being warmer). Since the cause creates an effect that doesn't move in the same direction, this is an example of a negative feedback. In conclusion, an increase in atmospheric CO₂ would lead to an increase in the absorption/formation of ocean acidification in cooler waters, and a decrease in warmer waters. pH levels will increase or decrease as well.

25



* I came to your office hours before the final and times before then. Science is not my thing but I really tried! :"

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect is when IR radiation rays, solar rays and infrared rays infiltrate the Earth's atmosphere. Some of these rays are absorbed by the Earth but some are reflected back into space. The greenhouse effect is needed to keep our Earth mildly heated, without it, life would be unsustainable. If ash clouds formed and blocked off the sun's rays from warming the Earth there will be an initial decrease in temperature. Although there is ash formation, some rays will still continue to create a greenhouse effect so once these ash clouds are gone there will be a dramatic increase in temperature and the temperature range will be extreme. The increase in volcanism is due to tectonic plates subducting one under the other and the Earth's core filled with magma pushing these plates up until the volcano erupts and then causes the excess ash.



Extra credit (2 points).

- 2 How are evaporation and degassing similar and/or different?

Evaporation & degassing are different because through evaporation there is a change in matter. Liquids are formed into gases. When something is degassing there is no matter change, goes from gas to gas releasing on earth.

Earn up to 1 additional point on your course grade

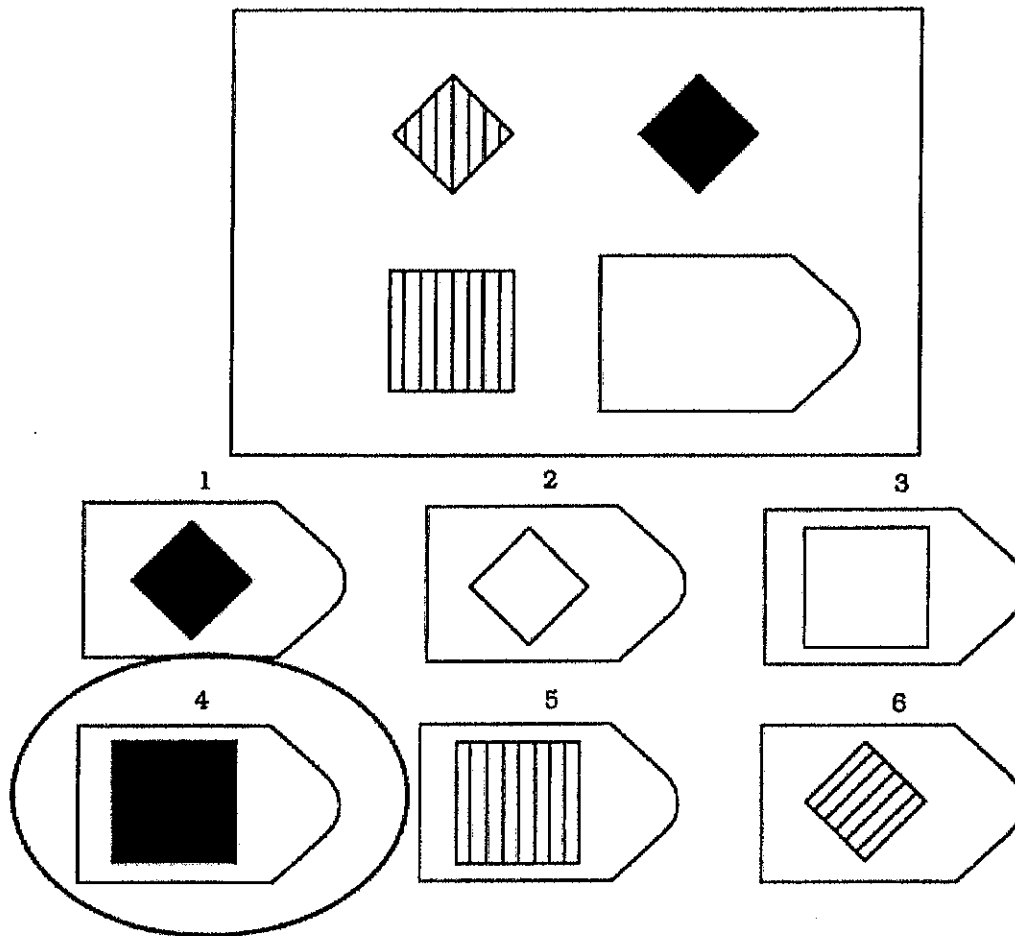
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

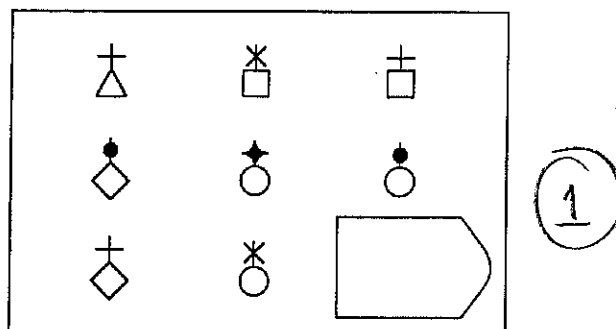


Answer: 4

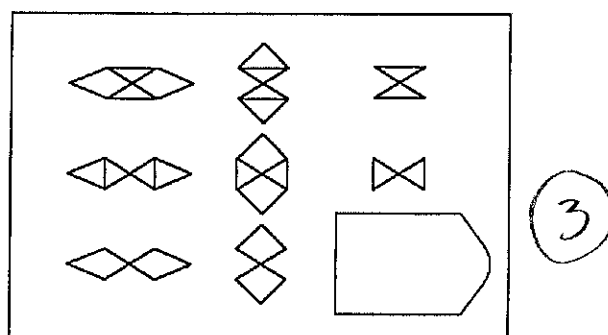
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

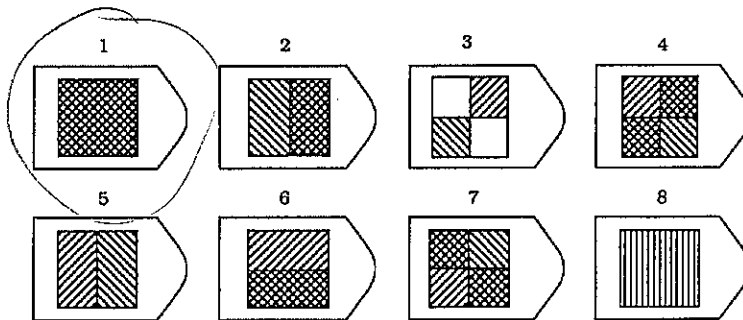
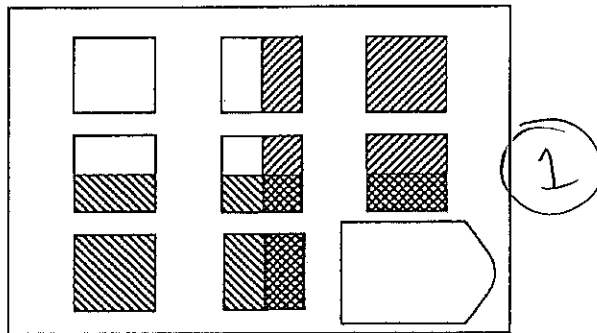


PATTERN 2

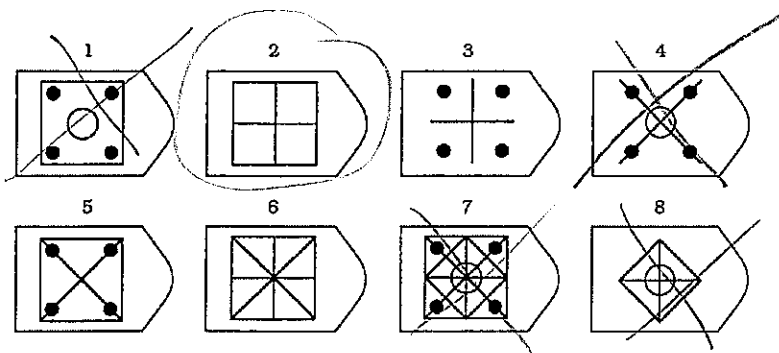
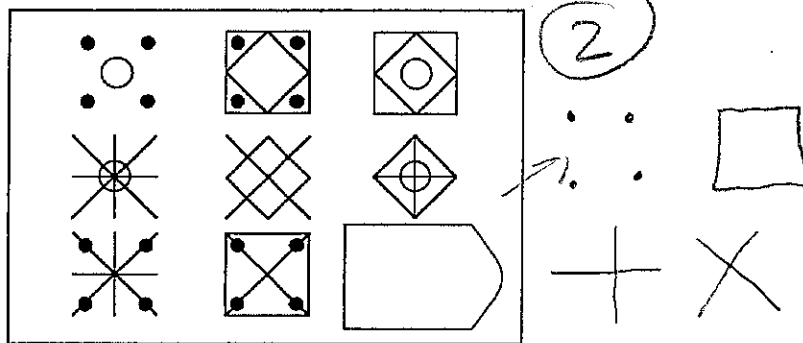


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PATTERN 3



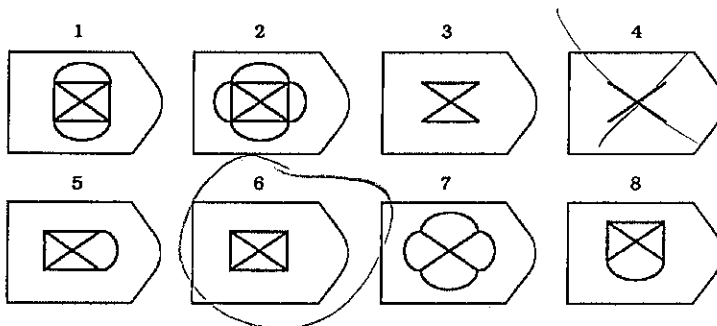
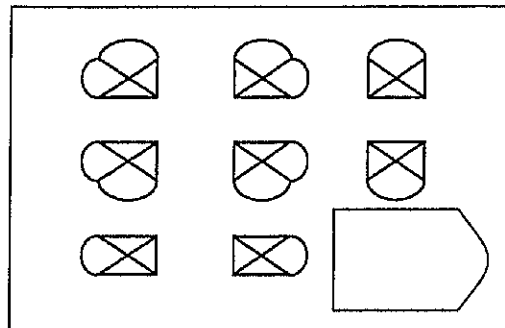
PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

A42185423

PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

- C 1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.
- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
 - B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
 - C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
 - D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.
- Q 2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.
- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
 - B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
 - C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
 - D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.
- Q 3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.
- A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
 - B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
 - C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
 - D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.
- C 4. The rival gangs used graffiti to define their territorial boundaries.
- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
 - B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
 - C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
 - D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - ☒ B. Steven avoided midweek outings in order to have the time for a weekend trip out of town.
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48026

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☒ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A43012134
Version A

GROUP: X

82

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- ☒ a. The magma becoming colder - slow down
☒ b. Gas bubbles forming in the magma - when the gas is released the magma becomes even more less dense than surrounding crust. Increase the rate it rises.
☒ c. The surrounding crust becoming hotter
☒ d. Crystals forming in the magma - slow down

2. Which of the following would be considered a negative feedback to increasing global temperature?

- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed.
☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere.
☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat.
☒ d. An increase in desert formation resulting in more dusting-blowing into the atmosphere - meaning visible light will be reflected to space before it can be absorbed and re-emitted by earth's surface. Meaning will cool.
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

☒ A= erosion, B= deposition, C= uplift and erosion

☒ b. A= erosion, B= biochemical precipitation, C= uplift and deposition

☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion

☒ d. A= dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☒ a. Human activities are the primary cause of the greenhouse effect.
☒ b. Natural processes are the primary cause of the greenhouse effect.
☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☒ e. The human and natural causes of the greenhouse effect are not understood.

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☒ c. Reservoir A and Reservoir B have equal residence times.
☒ d. More information about Reservoir A and Reservoir B is needed.

$$\frac{10^B}{5} = \frac{20^A}{5}$$

2 4 longer

Ant Insol Flux

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B**
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

Cannot be calculated b/c
inflow \neq outflow

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A**
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease - when it is reflected the atmosphere is not warmed.
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- C**
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

release when forming
use to break

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- C**
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

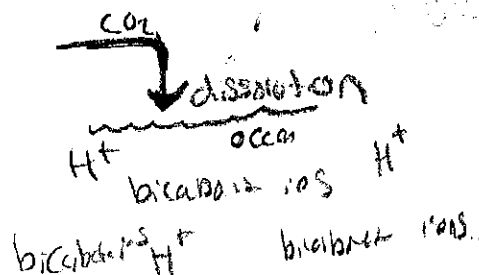
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explaining the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A. Ocean acidification is the process where CO_2 mixes with H_2O to form bicarbonate ions and hydrogen acidity. The concentration of hydrogen (H^+) molecules. If there's more CO_2 in the air then more is in the oceans.



25

B. Positive feedback: more CO_2 in atmosphere means more are going into the ocean. This means more H^+ (hydrogen) will be formed increasing acidity.

Negative feedback: Although CO_2 is mixed with H_2O in the ocean to form H^+ , warm water does not hold as much CO_2 as cold water. This is because molecules in warm water are moving faster blocking the CO_2 from entering (similar to when Nicole could not get her H^+ fasts in your rapidly moving H_2O fast lane). Less CO_2 entering means less H^+ means and less acidity.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

25
A. The green house effect is the process of warming the earth by heat originating from the Sun. The sun emits wave lengths, mostly visible that are either reflected or absorbed by earth's surface. The reflected visible light goes to space and does not warm the earth. The absorbed visible light gets converted to Infrared (IR) and is re-emitted into the atmosphere, e.g., in the atmosphere are easy absorbers of IR so they absorb IR get excited and re-emit it back to earth where it again is either absorbed or re-emitted to space. If ash is in the atmosphere then wave lengths from the sun will be reflected (which are not warming) to space before they can reach earth and get absorbed, converted and re-emitted absorbed by g.g. and re-emitted.

B. With Ash preventing most visible light to reach earth, visible light cannot be absorbed, converted to IR and re-emitted into atmosphere where it would have been absorbed by greenhouse gases and re-emitted again, without this we have global cooling.

Extra credit (2 points).

2 How are evaporation and degassing similar and/or different?

Evaporation \rightarrow liquid to gas (changes phase)

degassing \rightarrow gas in liquid to gas in atmosphere (no phase change)

Earn up to 1 additional point on your course grade

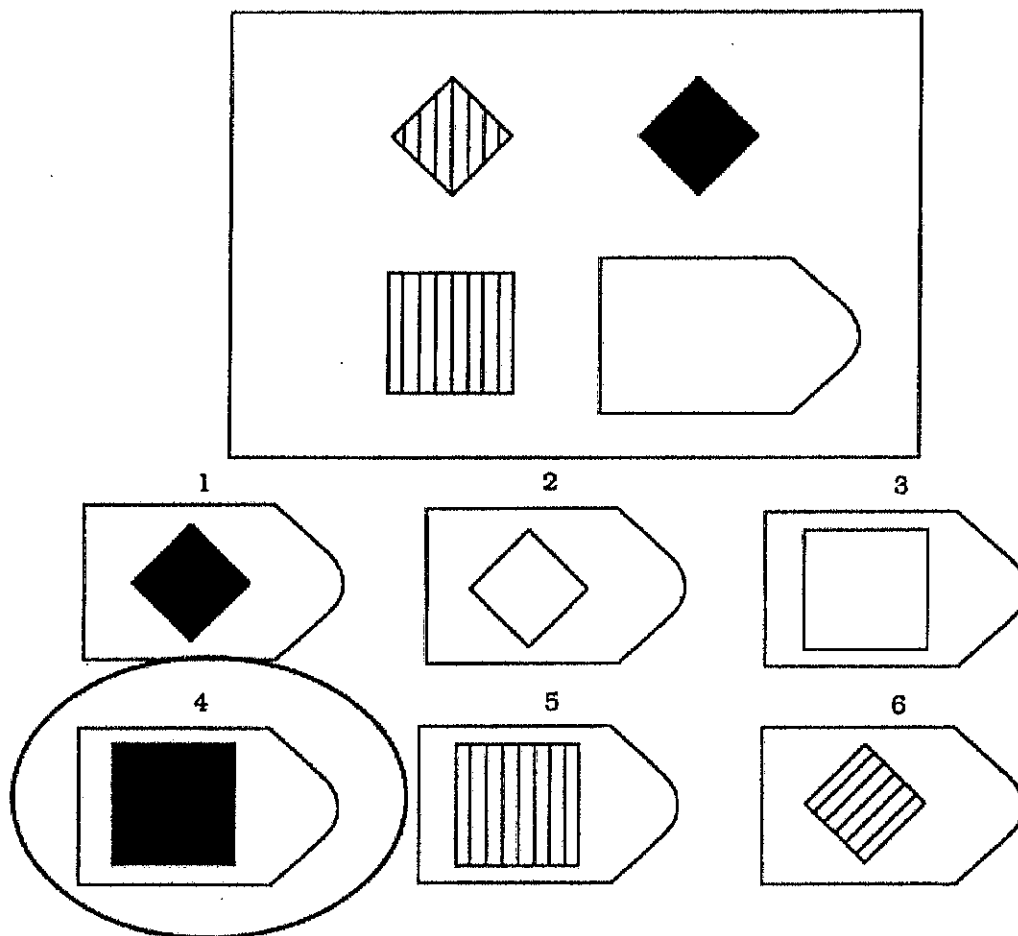
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

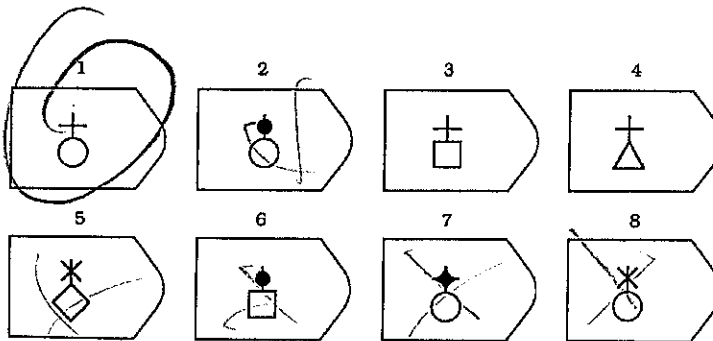
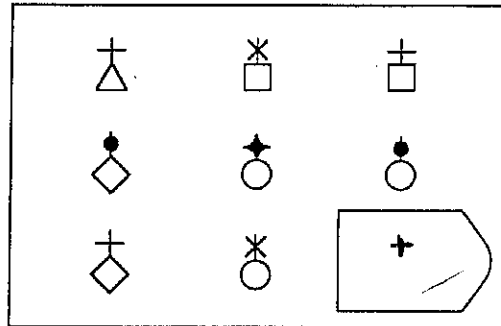


Answer: 4

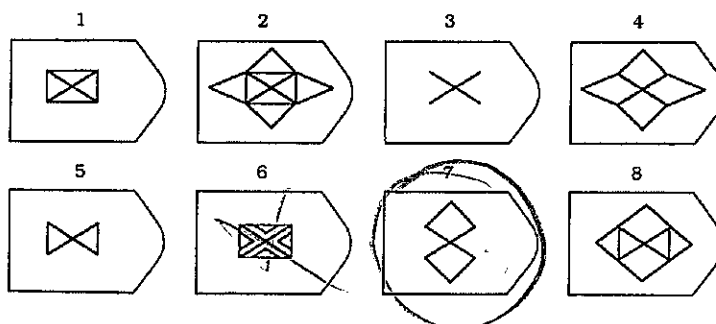
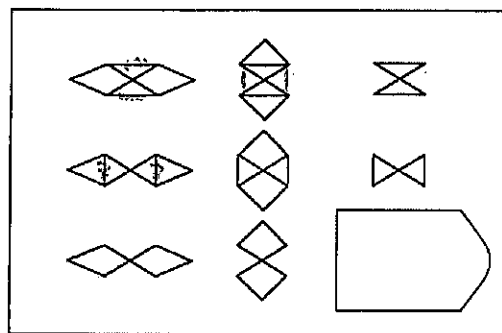
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Please choose the image that best completes each of the following patterns.

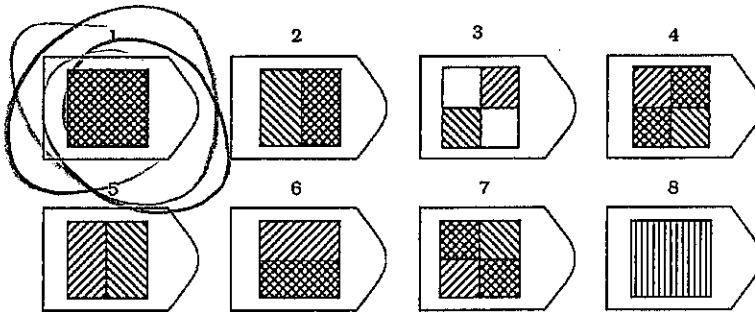
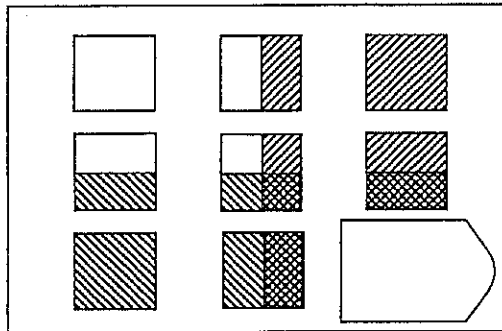
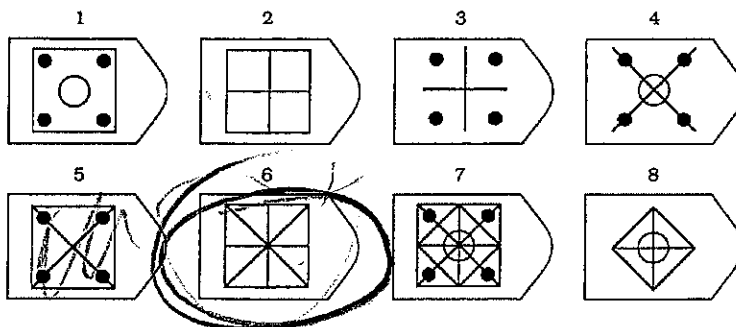
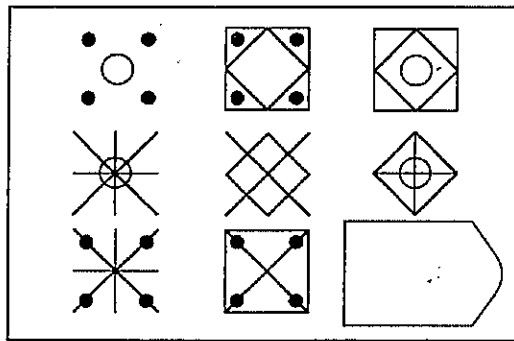
PATTERN 1



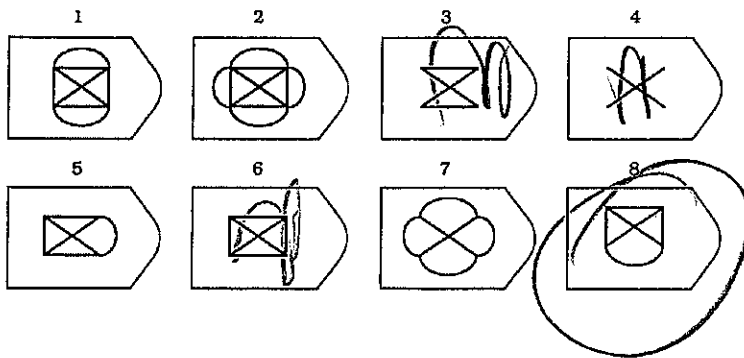
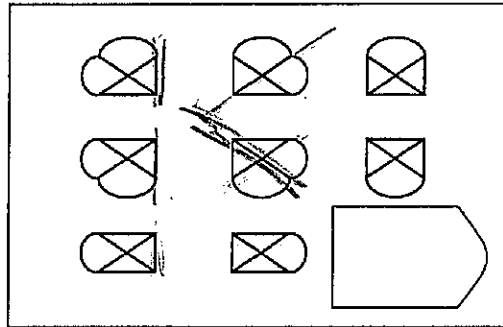
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - ☒ C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- ☒ D. Forgetting to do your homework. They are similar because they are both preventable.
- ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48911

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: ~~XXXXXXXXXX~~
Version B ID: A42480810

GROUP: ~~XXXX~~ X

90

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A = erosion, B = deposition, C = uplift and erosion
 - A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - ☒ Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
- A 20 B 10
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- The reservoir will eventually disappear.
 - ☒ The reservoir is not in equilibrium.
 - The reservoir is growing smaller.
 - The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ The Earth's atmosphere would become colder than it is today.
 - The Earth's atmosphere would become warmer than it is today.
 - The Earth's atmosphere would remain about the same temperature as it is today.
 - The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ Reflection of more solar radiation, causing atmospheric temperature to decrease.
 - Reflection of more solar radiation, causing atmospheric temperature to increase.
 - Re-emitting of more infrared radiation, causing atmospheric temperature to increase.
 - Re-emitting of more infrared radiation, causing atmospheric temperature to decrease.
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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 - More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification is the process through which the Earth's oceans absorb carbon dioxide or degas CO_2 . Absorption of CO_2 in the atmosphere by the ocean water takes place through dissolution. Colder oceanic water more readily absorbs CO_2 . Absorption of CO_2 causes the CO_2 to mix with the water (H_2O) and this creates the acidic carbonic acid or HCO_3^- .

When oceanic water is warmer, it more readily releases or degasses the HCO_3^- into the atmosphere, causing CO_2 to be released in the atmosphere. An increase in atmospheric CO_2 would lead to higher temperatures which will make the ocean water warmer and as a result, more CO_2 would be degassed by the ocean into the atmosphere - which will increase the CO_2 in the atmosphere even further causing the Earth's atmosphere to become even warmer - this is an example of a positive feedback. However countervailing forces will limit: the ocean's water from increasing its pH through continual degassing. When there is an increase in atmospheric CO_2 , the ocean's water will also absorb some of the extra CO_2 in order to balance out the carbon cycle, this will reduce CO_2 in atmosphere and reduce atmospheric temperatures - an example of a negative feedback. Thus due to the interplay between positive and negative feedback, oceanic pH levels will decrease but not significantly due to countervailing forces.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect is caused by naturally occurring gases in the atmosphere such as water vapor, CO_2 and methane which traps the infrared radiation re-emitted from the Earth's surface. Greenhouse gases do not absorb the visible light from solar radiation. However, when visible light is absorbed by the earth's surface, it is re-emitted as infrared which is absorbed by the greenhouse gases and re-emitted into the atmosphere where in turn it makes its way back to the Earth's surface thus "trapping" this heat within the earth's atmosphere. Volcanic activity releases a lot of ash which blocks the solar radiation from entering the Earth's atmosphere. Without this solar radiation, the greenhouse effect is weakened due to the decrease in visible light absorbed and re-emitted by the earth's atmosphere. Thus, with less heat being made available to trap by the greenhouse gases, due to this volcanic ash, global cooling occurs. This means an increase in volcanic activity would contribute to decreased global atmospheric temperatures.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

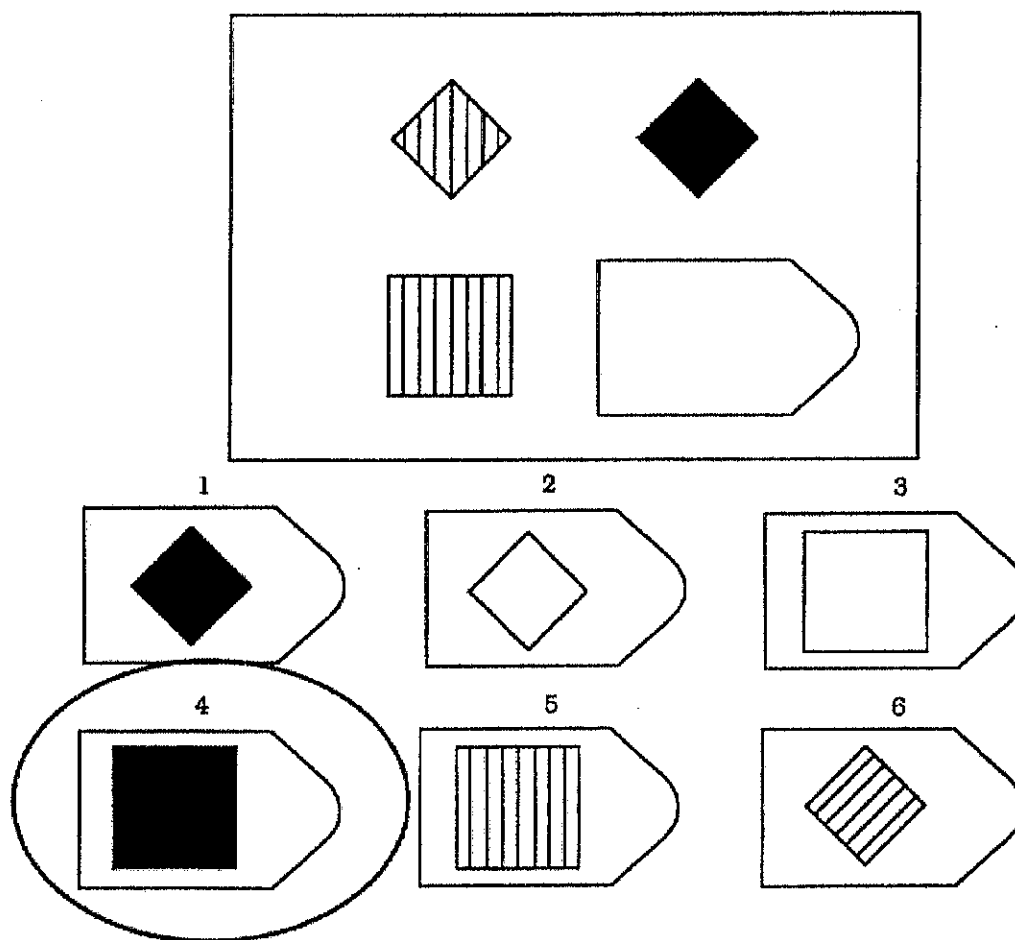
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Thoughtfully complete the attached survey

Analogical Assessment

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Example

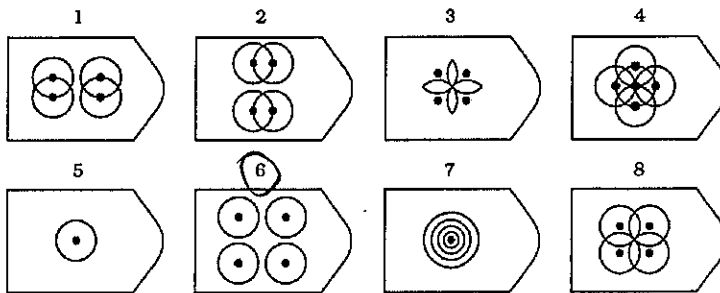
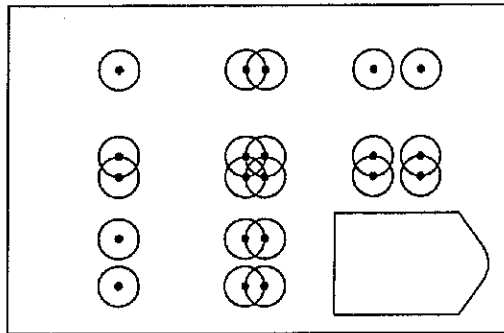


Answer: 4

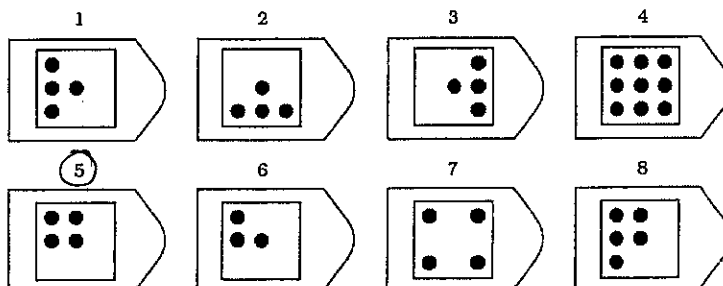
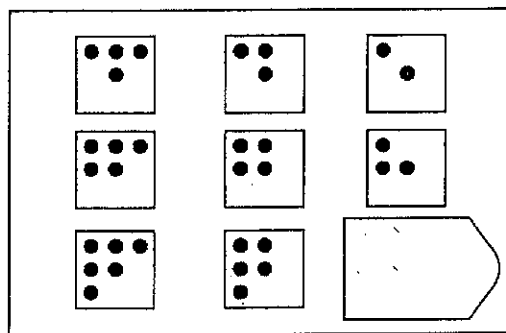
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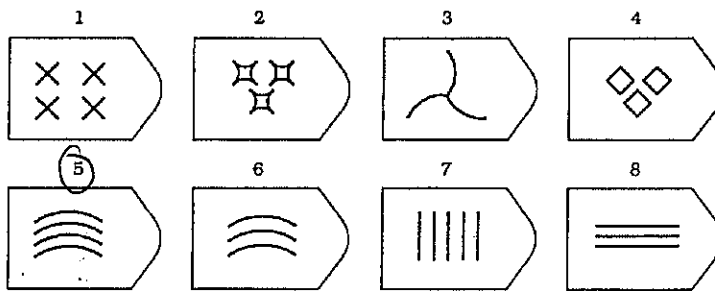
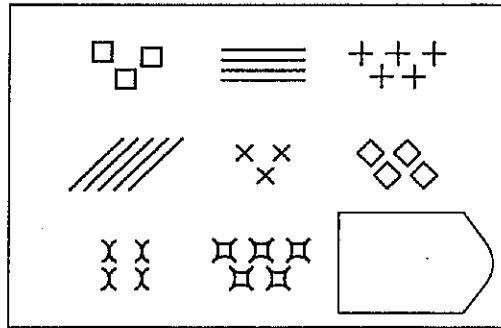
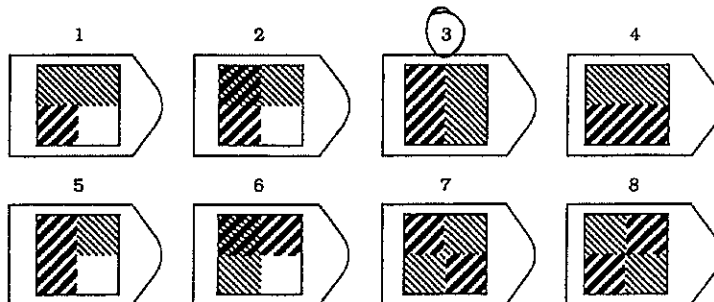
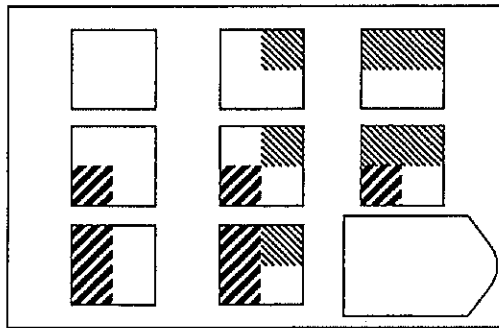
PATTERN 1

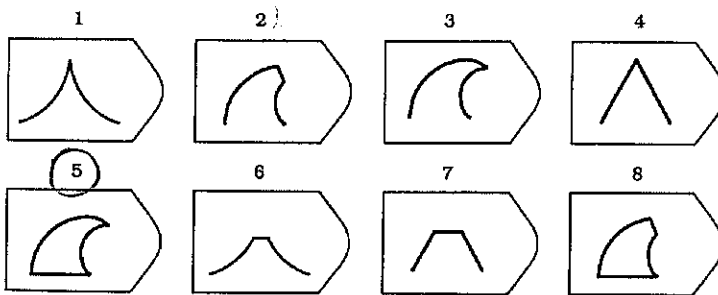
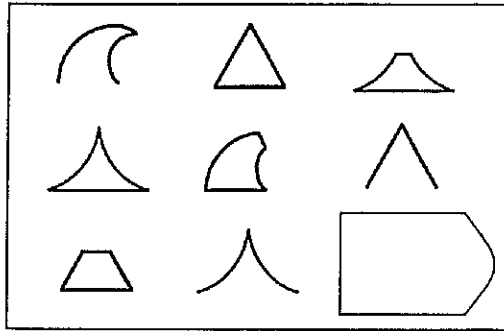


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- ☒ D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48825

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☒ Other

STUDENT NAME: A43398594
Version A

GROUP: X

40

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
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 - d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☒ a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
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5. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
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6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
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7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
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- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
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 - ☒ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase of atmospheric carbon dioxide will also increase the amount of carbon dioxide in the ocean because CO_2 may? dissolve in the ocean. Adding more CO_2 in the H_2O increase the carbonic acid which also increases the hydrogen atoms, and with more hydrogen atoms it increases the acidity in the oceans and it also affects the marine organisms which are sensitive to the amount of acidity in the ocean. The good thing is that oceans can help decrease the amount of carbon dioxide in the atmosphere, but if it absorbs too much, it can lead to an increase of hydrogen atoms which is harmful to marine organisms.

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

An increase of volcanism would increase the temperature of Earth's atmosphere. As the ash clouds rise due to its lower density, (it also traps CO_2) and along with the other natural gases, increase the temperature of the climate. These large ash clouds traps the heat from escaping Earth's surface and is re-radiated from the clouds. As the temperature of the atmosphere increases it also increase the Earth's surface which may result in more volcanic activity and more large ash clouds.

5

0.5

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

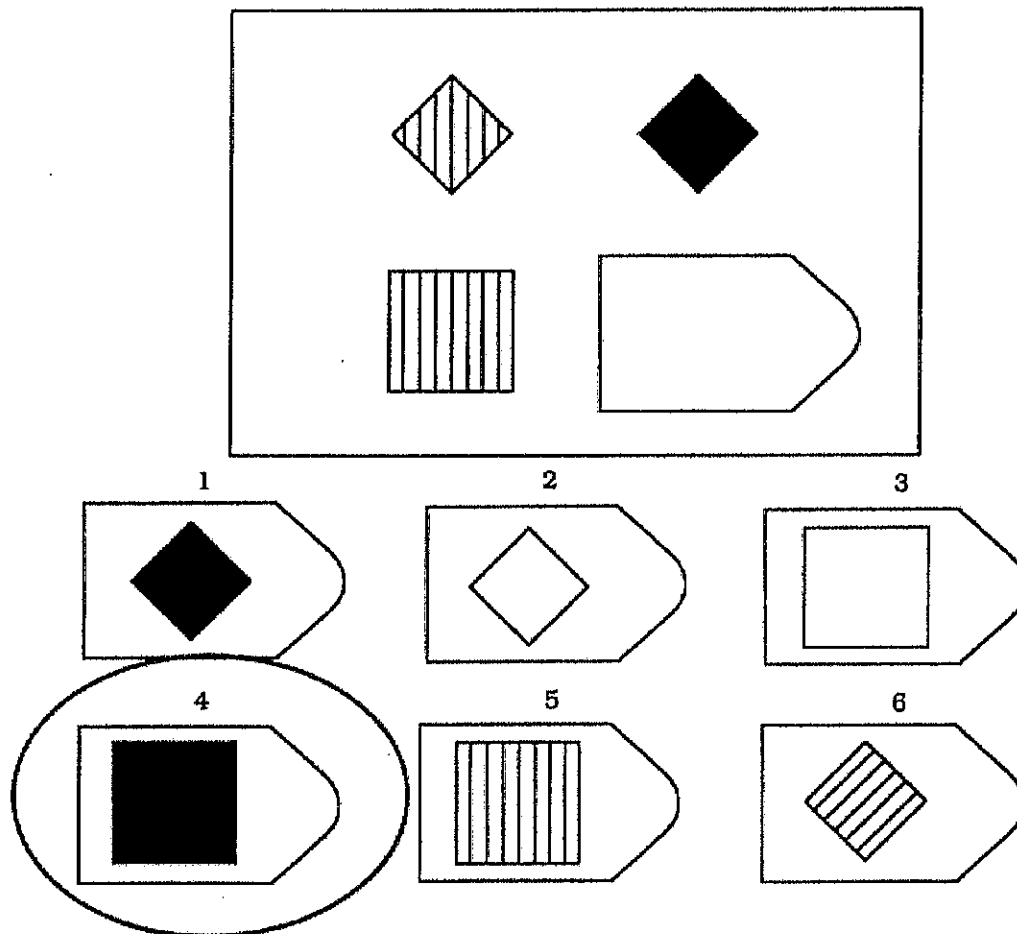
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

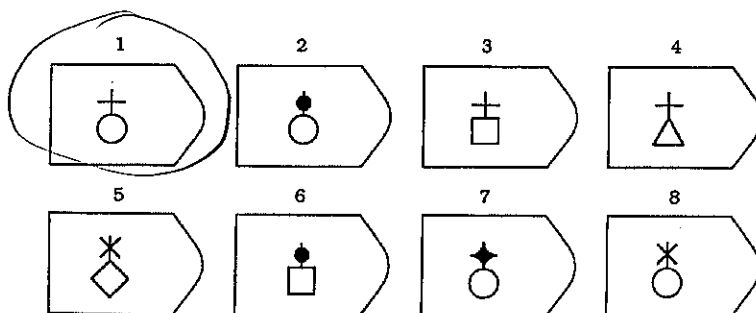
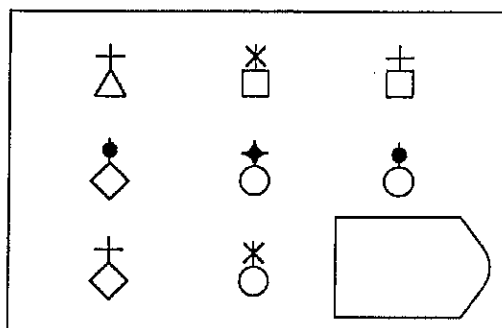


Answer: 4

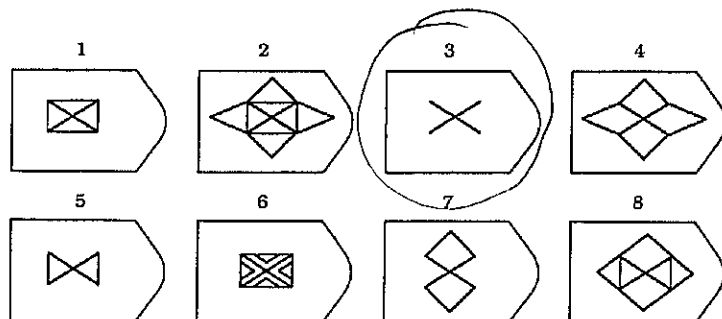
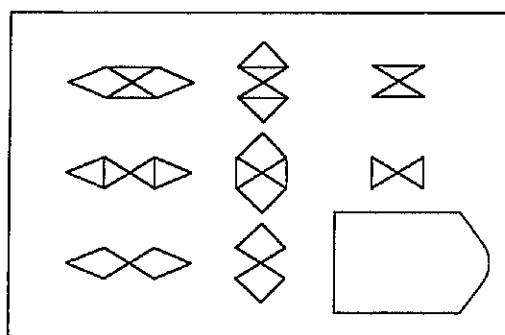
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Please choose the image that best completes each of the following patterns.

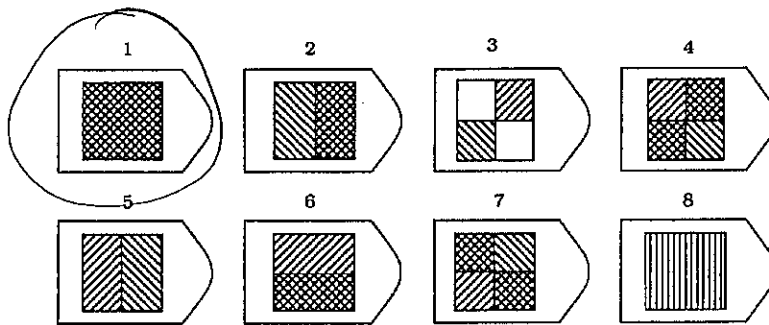
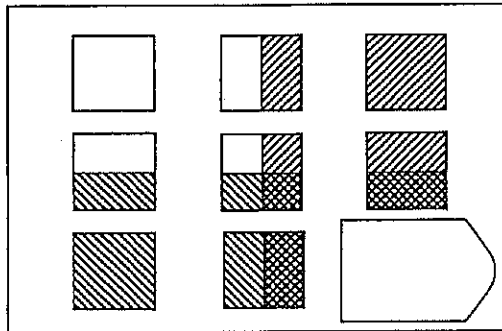
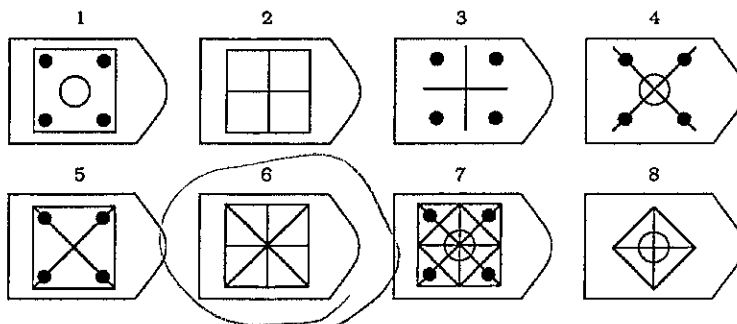
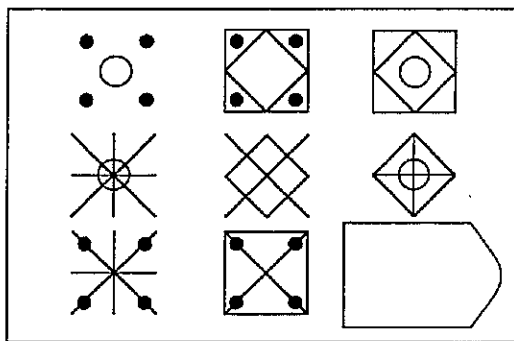
PATTERN 1



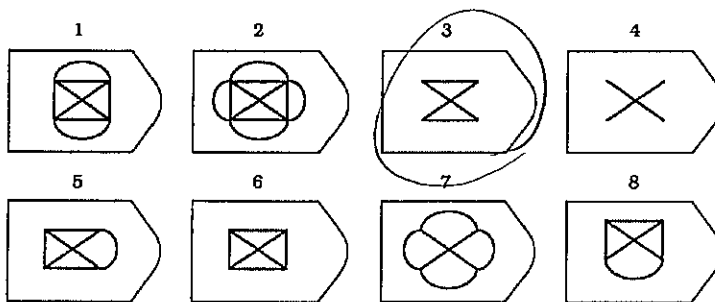
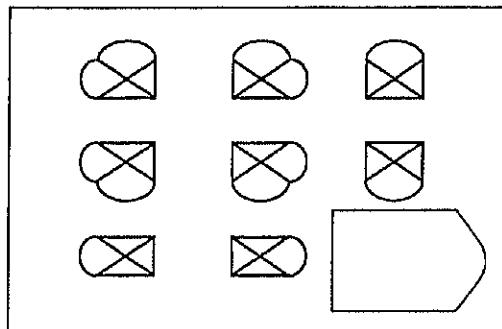
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

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- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - ☒ C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - ☒ B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48386

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☐ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☒ Other

STUDENT NAME: A31630993
Version A

GROUP: X

81

MULTIPLE-CHOICE. 5 points each (50 points total).

- B 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- ♡ 2. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- C 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
- C 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- A 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- B 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

- B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- A 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- C 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- A 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

If more CO_2 is in the atmosphere it would lead to more CO_2 in the oceans. The more CO_2 in the ocean the more acidic it becomes.

As CO_2 combines with water it creates acidic positive ions into the water. This CO_2 is released into the atmosphere which increases

greenhouse gases. These gases increase which leads to temperature increases. The increased temperature leads to more cloud creation. More clouds leads to more of the sun's rays being reflected back into space which could lead to the temperature decreasing.

If the temperature decreases this could lead to less permafrost and cause fewer glaciers to melt. With more glaciers, more sun light is again reflected into space which would lead to global cooling, and ocean cooling.

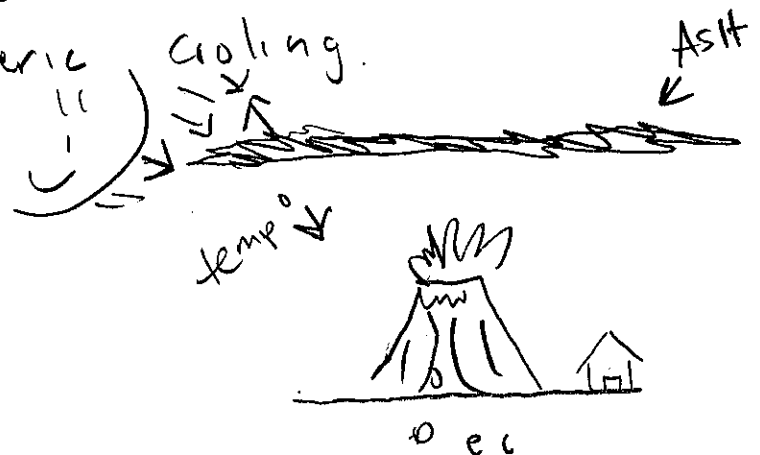
Cooler oceans can hold less CO_2 and less CO_2 leads to fewer CO_2 and H_2O bonds which creates ocean acidification. The cooler temperature would also lead to less evaporation which places CO_2 in the atmosphere.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If there was an increase in volcanism the earth's temperature would decrease. Volcanoes release sulfur into the atmosphere which reflects the sun's rays back into space. With less of the sun's rays reaching the surface, this visible light could not be changed into heat energy and absorb and ~~reflected~~ by the earth's surface. Usually this ~~reflected~~ heat is trapped by greenhouse gases which re-admits the heat energy it absorbs, thus heating the atmosphere. But with the volcanic cloud most of these initial sun rays will not reach the earth's surface, leading to atmospheric cooling.



24

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Degassing is the release of gas from a liquid into the atmosphere. Evaporation is the changing of a liquid to gas form.

Earn up to 1 additional point on your course grade

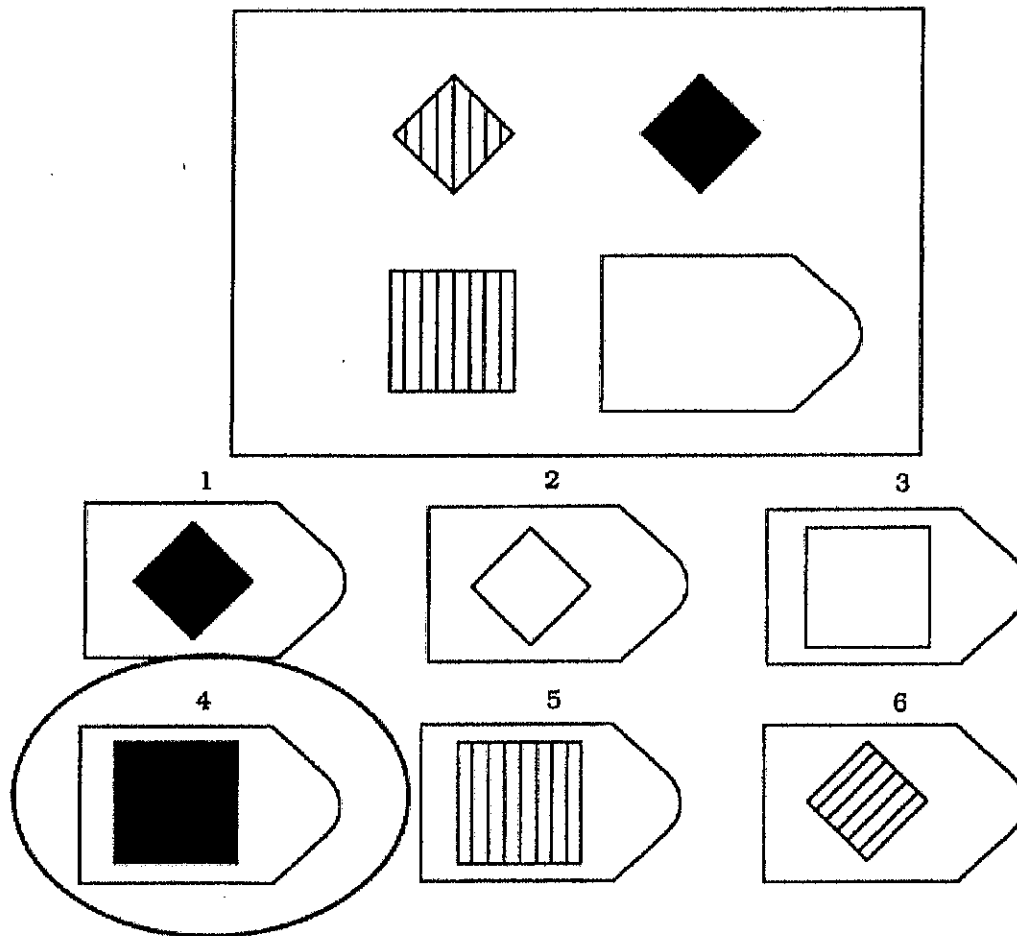
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

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Example

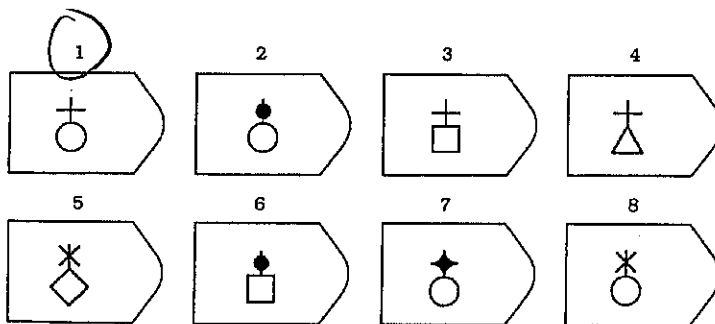
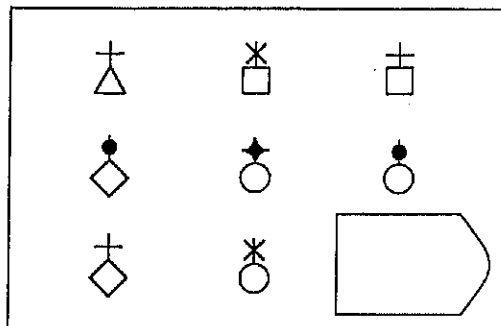


Answer: 4

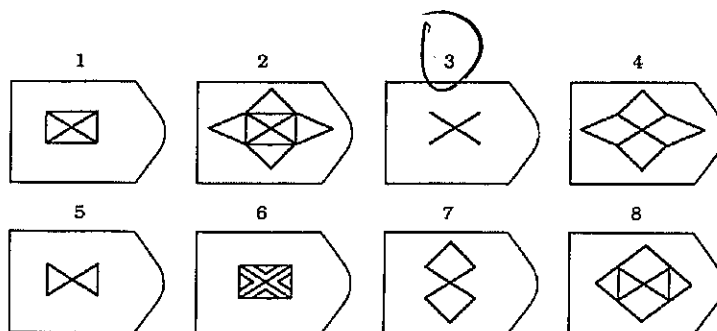
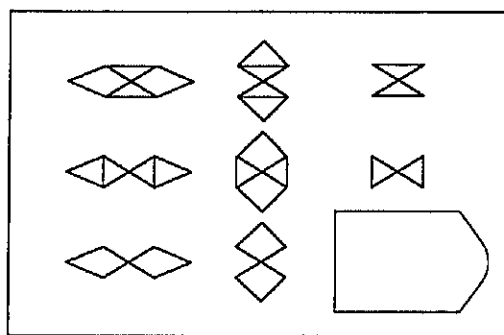
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Please choose the image that best completes each of the following patterns.

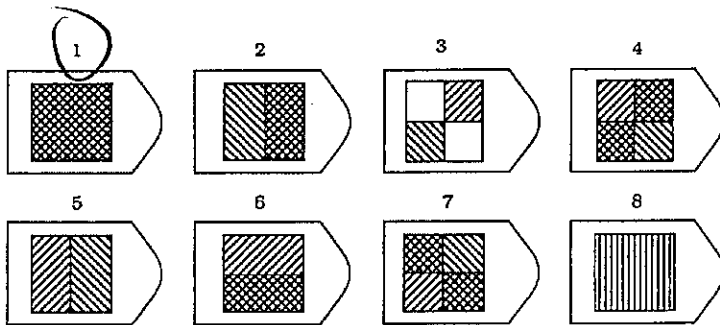
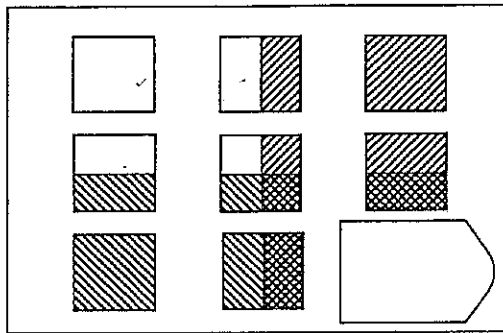
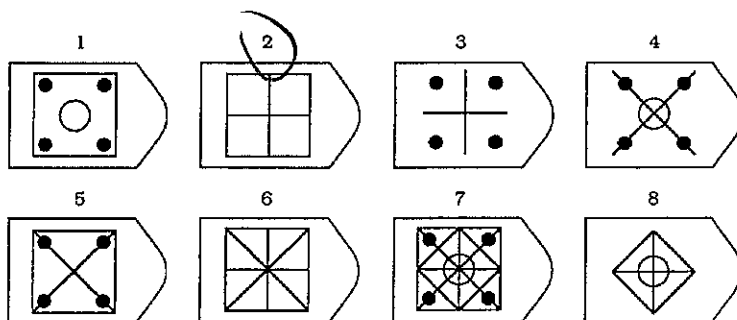
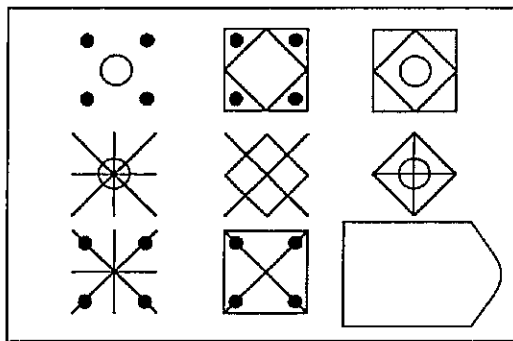
PATTERN 1



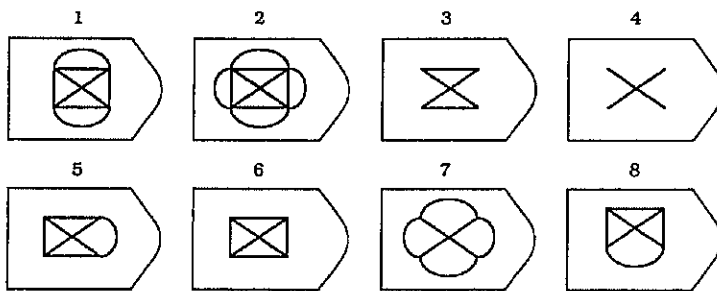
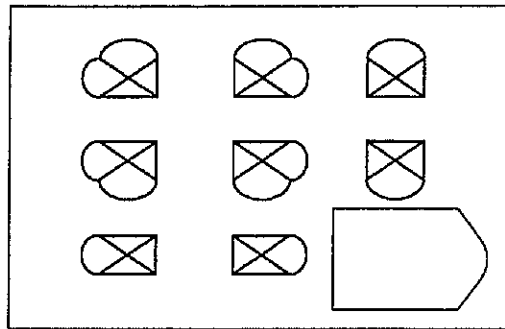
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

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PLEASE CONTINUE ON NEXT PAGE

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- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

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-

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- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- ☒ B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 27 years

What is your home zip code? 23462

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

I went to your office hours
before the exam

1

STUDENT NAME: A35919773
Version A

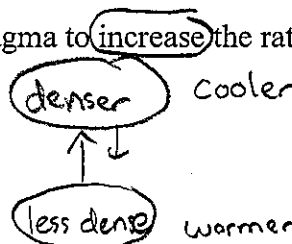
GROUP: Y

92

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- a. The magma becoming colder
b. Gas bubbles forming in the magma
c. The surrounding crust becoming hotter
d. Crystals forming in the magma



2. Which of the following would be considered a negative feedback to increasing global temperature?

- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
b. Melting of permafrost resulting in more methane escaping into the atmosphere
c. An increase in evaporation and cloud formation resulting in the release of latent heat
d. An increase in desert formation resulting in more dusting blowing into the atmosphere

look for dec.
temp.

Although clouds block light which would lead to cooling, C says 'release of heat'

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A = erosion, B = deposition, C = uplift and erosion
b. A = erosion, B = biochemical precipitation, C = uplift and deposition
c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
d. A = dissolution, B = deposition, C = uplift and deposition

Biochem. prec. is organisms using
Carbon for shells

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- a. Human activities are the primary cause of the greenhouse effect.
b. Natural processes are the primary cause of the greenhouse effect.
c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
d. Neither human activities nor natural processes are important causes of the greenhouse effect.
e. The human and natural causes of the greenhouse effect are not understood.

A is primary increase in greenhouse
effect

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- a. Reservoir A has a shorter residence time than Reservoir B.
b. Reservoir B has a shorter residence time than Reservoir A.
c. Reservoir A and Reservoir B have equal residence times.
d. More information about Reservoir A and Reservoir B is needed.

$$RT = \frac{\text{Size}}{\text{Flux}}$$

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- B
- ☒ a. The reservoir will eventually disappear. *growing larger*
 - ☒ b. The reservoir is not in equilibrium.
 - ☒ c. The reservoir is growing smaller.
 - ☒ d. The reservoir's residence time is 10 years. *c RT can't be calculated*

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☒ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☒ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A
- ☒ a. The Earth's atmosphere would become colder than it is today. *eventually*
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

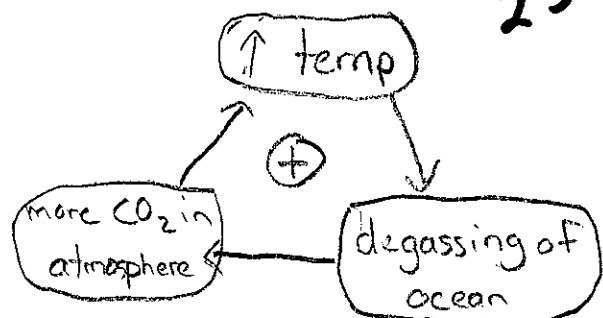
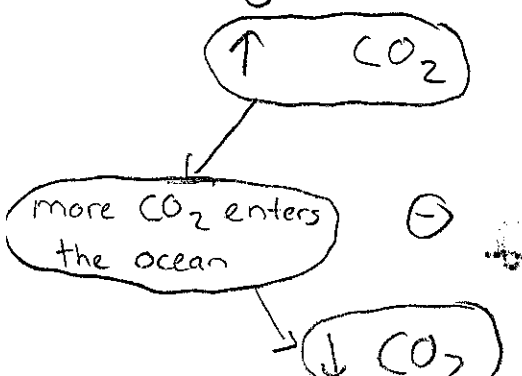
Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Increasing atmospheric CO_2 would disturb the current equilibrium between the atmosphere and the hydrosphere (ocean). To restore equilibrium, more CO_2 (gas) would have to enter the ocean from the atmosphere. Then, since there is more CO_2 in the atmosphere, more CO_2 would react with the water, causing an increase in hydrogen ions. This increase in hydrogen ions increases the acidification of oceans. This is not a feedback loop because this increase in ocean acidification does not start with a temperature change. (- feedback for CO_2 in atmosphere)

However, increasing atmospheric CO_2 also causes an increase in temperature, which increases ocean temperature. This causes the molecules of water to move faster, making it more difficult to trap and hold gas, resulting in less CO_2 being in the ocean, since the CO_2 would be released into the atmosphere. This would cause less CO_2 reacting to the H_2O , causing a decrease in H^+ ions, resulting in less ocean acidification. This would be a positive feedback loop, since the temperature of the atmosphere would rise because of the increase in greenhouse effect caused by the CO_2 .

25



2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If volcanism were to increase, and large ash clouds were in the atmosphere, there would be a decrease in the green house effect. The green house occurs when ^{visible} light from the sun passes through Earth's atmosphere, gets absorbed by the surface, converted to IR, and re-radiated into the atmosphere. With the presence of greenhouse gases, this IR energy gets absorbed, then re-emitted to the surface, essentially trapping the IR (heat) energy. However, volcanic ash prevents visible light ^{visible} from passing through the atmosphere to be absorbed by the surface. Thus, less ^{visible} light is converted to IR, and less IR is being trapped by the greenhouse gas. This decrease in trapping of IR causes Earth's temperature to go down. Therefore, an increase in volcanism would reduce Earth's atmospheric temperature.

25

22

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is turning from a liquid to a gas.

Degassing is a gas moving from a liquid to other gasses.

2

Earn up to 1 additional point on your course grade

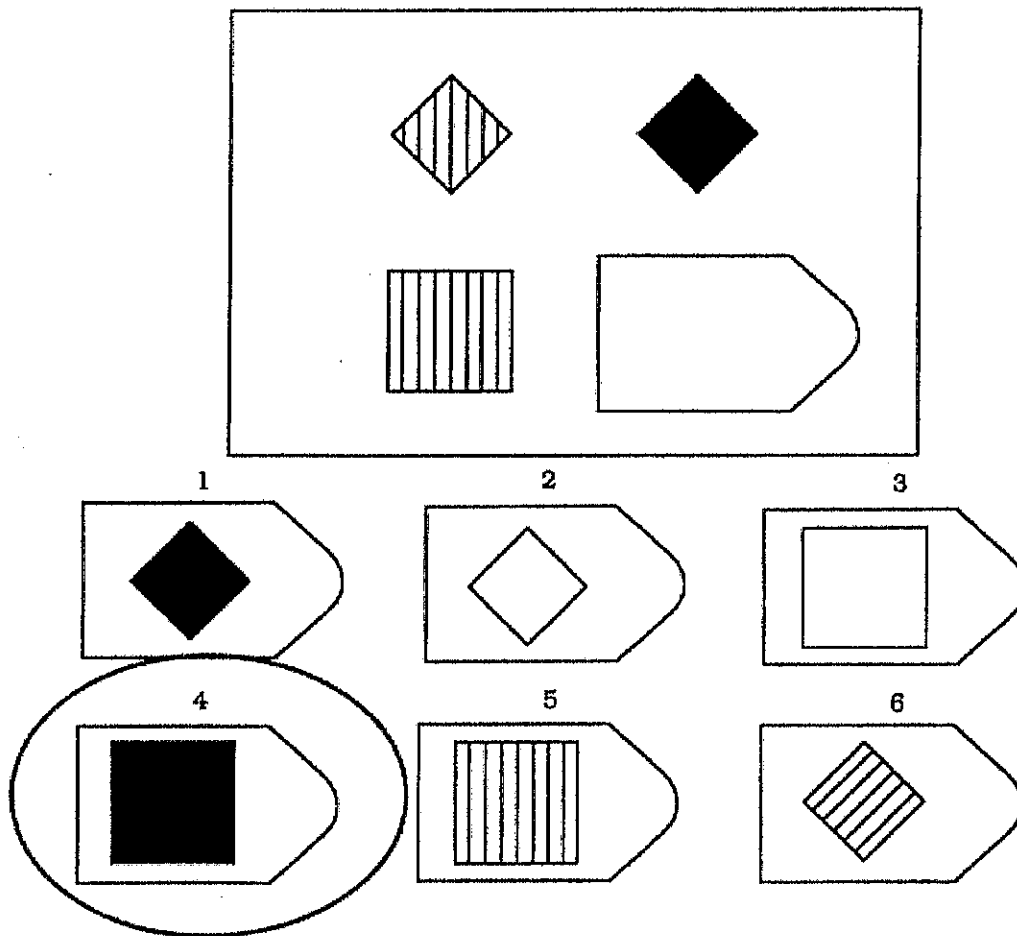
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

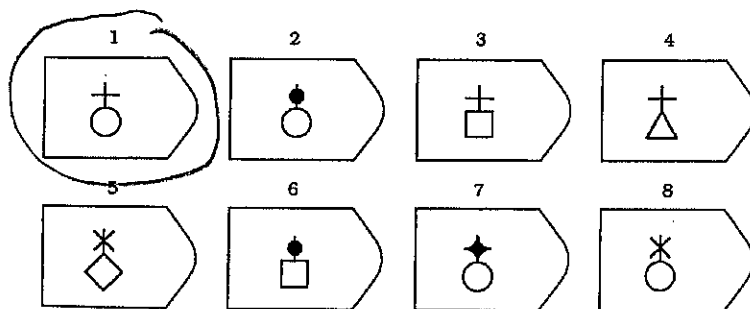
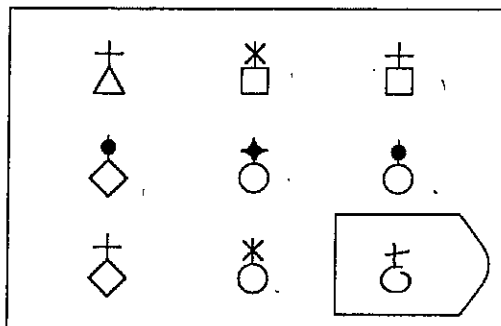
Example



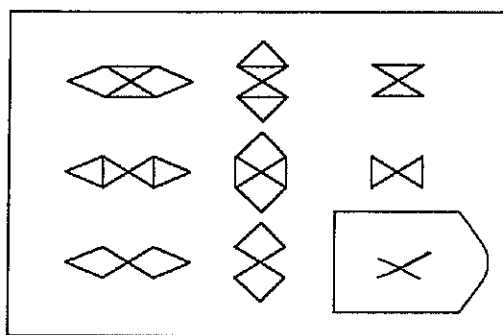
Answer: 4

Please choose the image that best completes each of the following patterns.

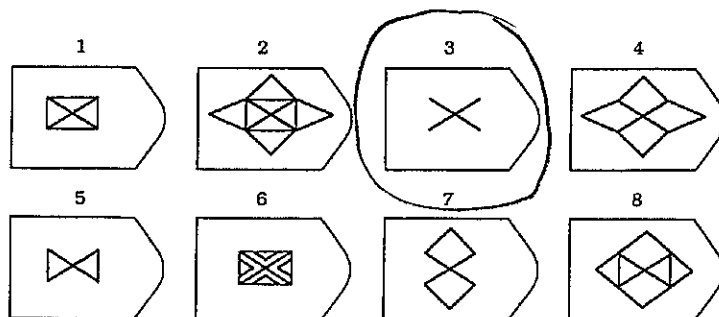
PATTERN 1

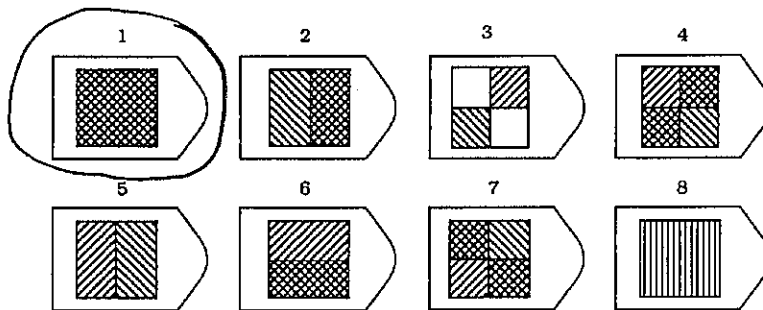
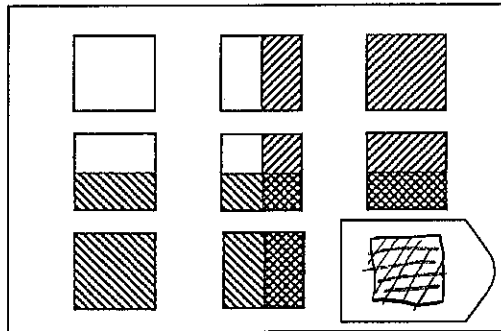
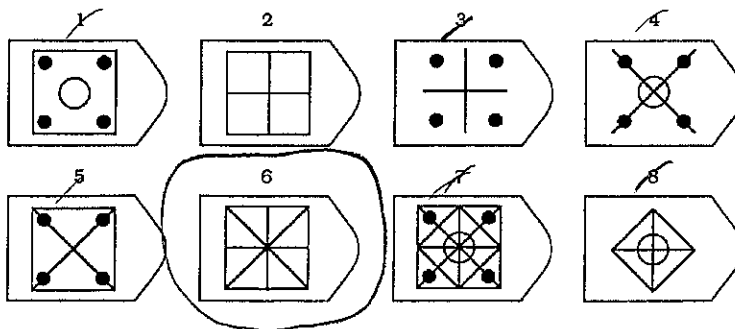
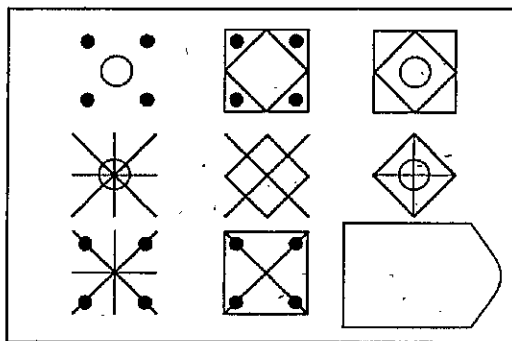


PATTERN 2

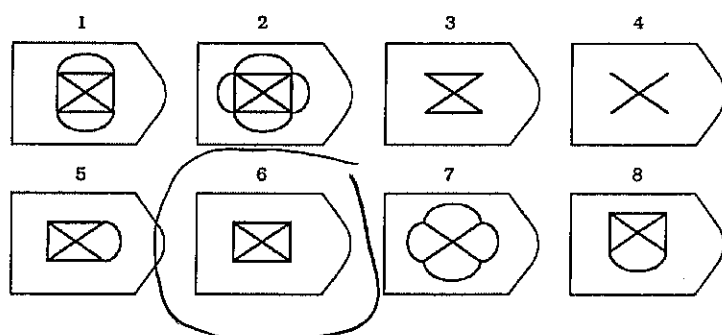
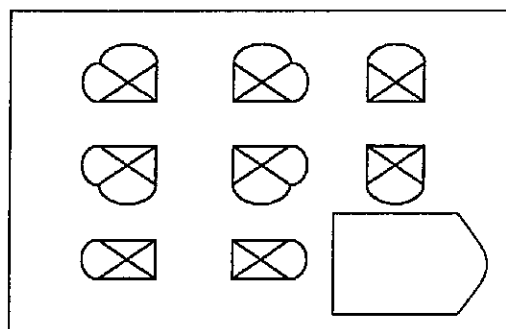


intersection?



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

effect

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- ☐ A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☐ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- ☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- ☐ D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- ☐ A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- ☐ B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- ☐ C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☐ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- ☒ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- ☐ C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- ☐ D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- ☐ A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- ☐ B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- ☐ D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - ☒ B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 24 years

What is your home zip code? 48038

What is your gender?

☒ Male
☐ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A40491423
Version A

GROUP: Y

70

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- B
- a. The magma becoming colder ~~X~~
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter ~~X~~
 - ~~X~~ d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature? $\uparrow k_{mp}$

- D
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere?

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- C
- a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - d. A = dissolution, B = deposition, C = uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- A
- ☒ a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ~~X~~ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ~~X~~ e. The human and natural causes of the greenhouse effect are not understood.

CO_2 in ocean \downarrow

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- A
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun $\downarrow k_{mp}$

\uparrow

6. Imagine two CO_2 reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO_2 influx and CO_2 outflow are equal. Which reservoir has the shorter residence time?

- A
- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.



$$\frac{100}{10} = 10$$

$$\frac{50}{10} = 5$$

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

$$\begin{array}{r} 1000 \text{ volume} \\ 100 \text{ in} \\ 50 \text{ out} \end{array} \quad \frac{1000}{150}$$

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

temp ↓
glaciers ↑

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

temp ↑
evap ↑
clouds ↑

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

less CO₂ at.
less in ocean
less acidic
↓

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

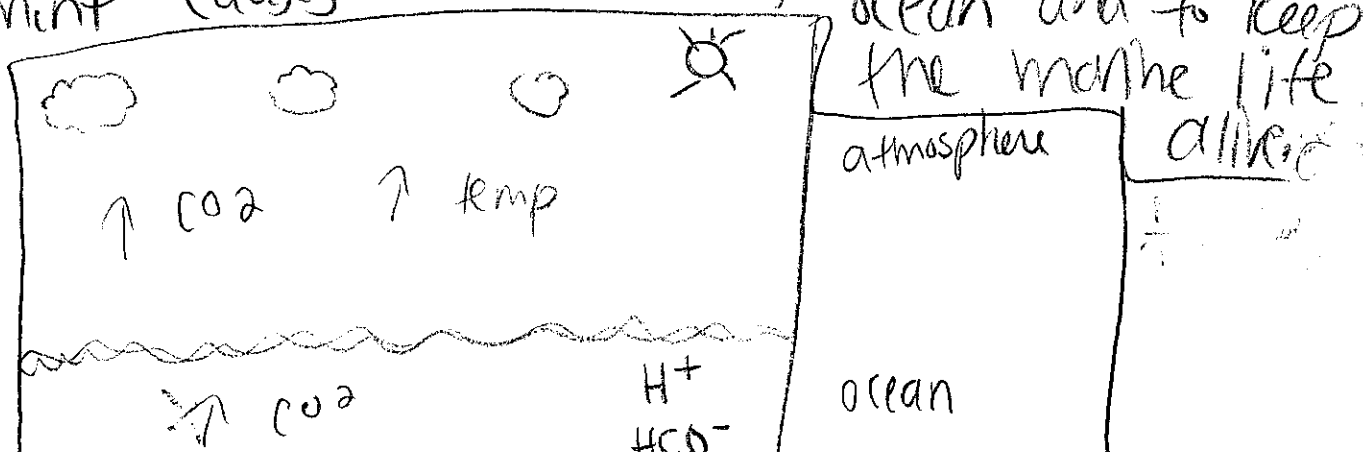
Your answer should include:

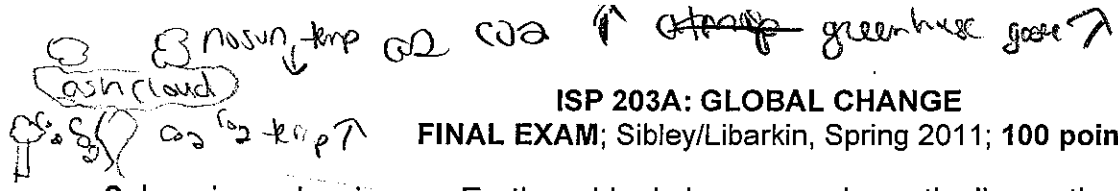
- a. An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- b. Discussion of both negative and positive feedback loops to the process of ocean acidification.

temp $\text{CO}_2 \uparrow$ CO_2 ocean \uparrow ocean acid \uparrow

positive = \uparrow atmosp \uparrow ocean

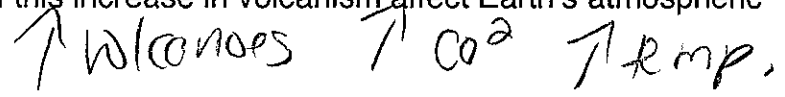
If there was an increase in atmospheric carbon dioxide, then ocean acidification would increase as well. This is due to the positive feedback loop of the atmospheric carbon dioxide to the oceanic carbon dioxide in the ocean. As CO_2 in the atmosphere increase CO_2 in the ocean increases. With an increase in CO_2 in the ocean, the ocean is more acidic since it is able to form more bonds with H^+ and ions. This increase in acidity could affect the marine life if at an extreme level. However the negative feedback loop of temperature and carbon dioxide aids in the removal of CO_2 from the ocean so that marine life is not affected. An increase in temperature in the atmosphere also increases the CO_2 of the atmosphere (and the temperature at the ocean). With an increased ocean temp the molecules move faster and this increase in molecular movement causes CO_2 to be pushed out of the ocean and to keep the marine life alive.




 Sun -> Earth -> Atmosphere -> Greenhouse gases -> Earth
 ash cloud
 FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

ISP 203A: GLOBAL CHANGE

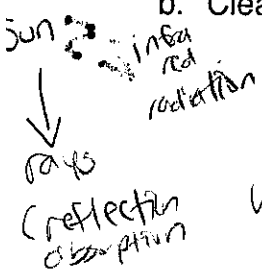
2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?


 ↑ volcanoes ↑ CO₂ ↑ Temp.

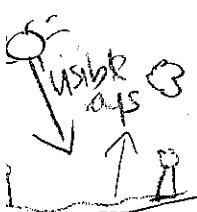
Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

10



If volcanoes suddenly increased dramatically on Earth, Earth's atmospheric temperature would be affected. Particularly, if volcanoes that erupt large ash clouds increased, then the ash clouds would block radiation from the sun. If radiation from the sun was blocked, the greenhouse effect would be changed. As CO₂ increases in the atmosphere, the greenhouse effect increases. CO₂ is not the only gas that affects the greenhouse effect. But an increase in CO₂ in the atmosphere not only increases the greenhouse effect but also the temperature of the atmosphere. The large ash clouds would inhibit the sun's ultraviolet rays? from hitting the Earth while capturing the CO₂ in the atmosphere until the volcanic ash cloud clears. Once the large ash clouds clear, the CO₂ would spread into the atmosphere more rapidly. With the ash cloud blocking the atmospheric clouds, the CO₂ would not be able to interact with the sun or clouds. The temp would get colder and colder since the large ash cloud would block the sun's rays from reaching the Earth.

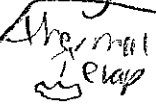


Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Both involve a thermal energy change and release energy into the atmosphere.

degassing



evap → water out. at

X

Earn up to 1 additional point on your course grade

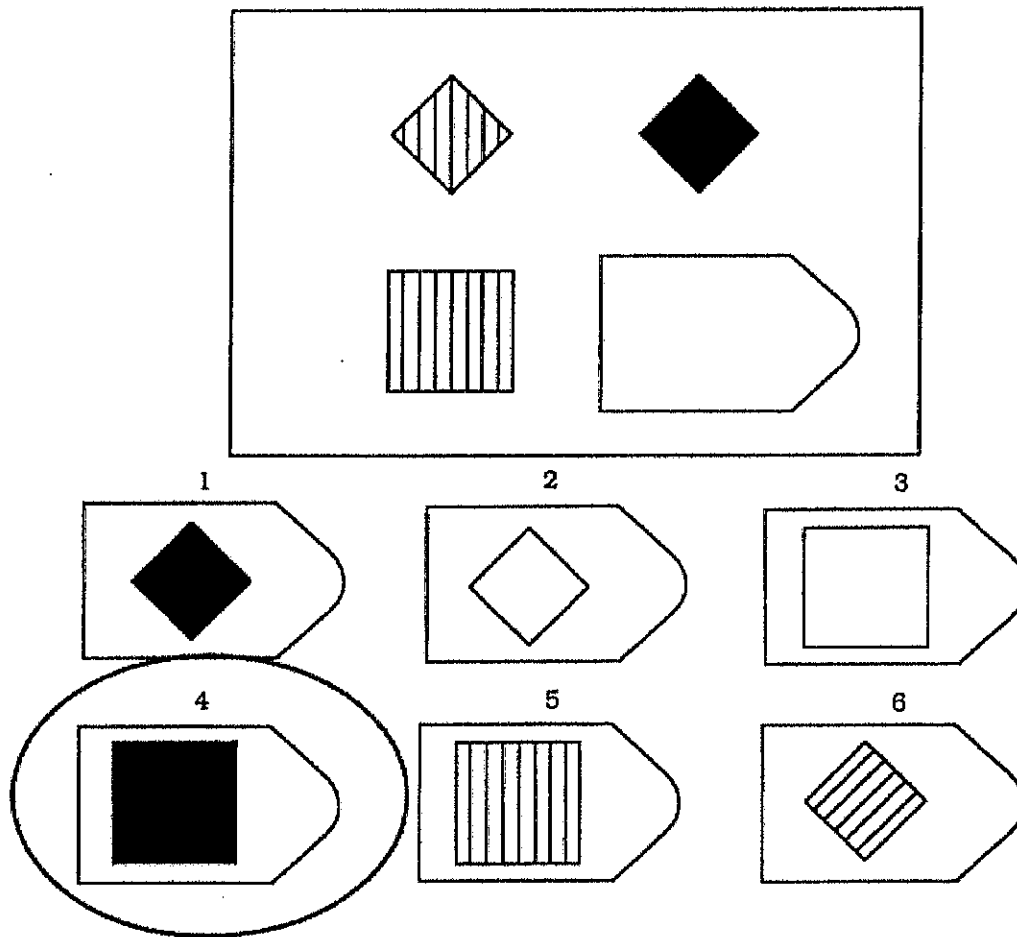
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

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Example

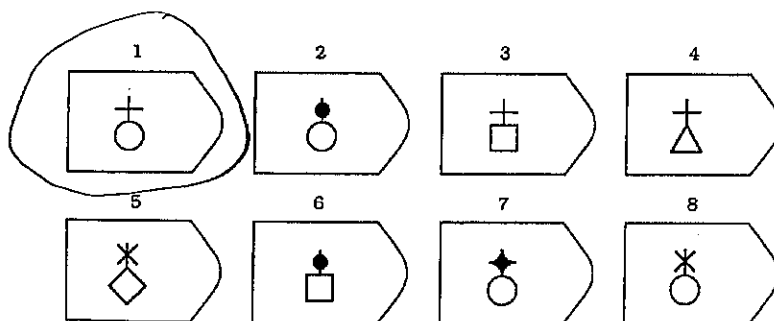
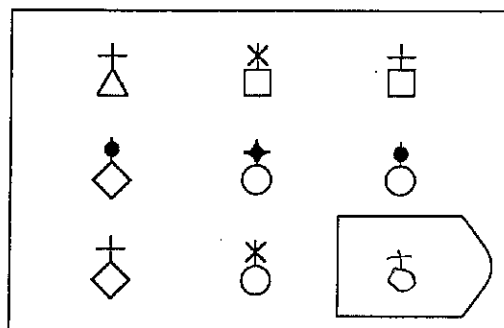


Answer: 4

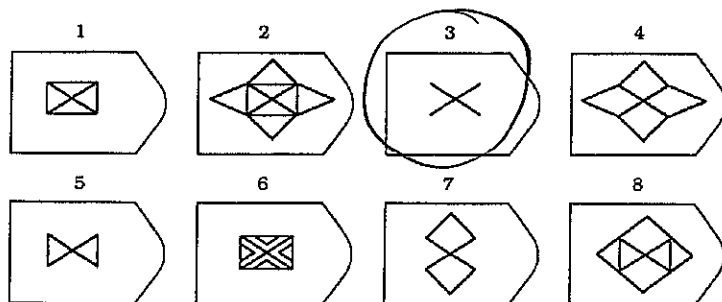
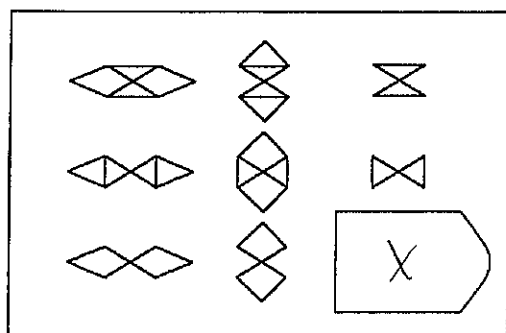
PLEASE CONTINUE ON NEXT PAGE

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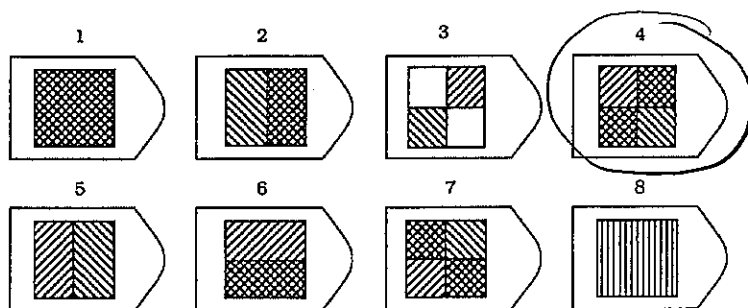
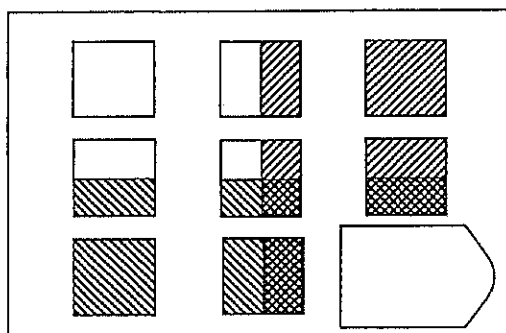
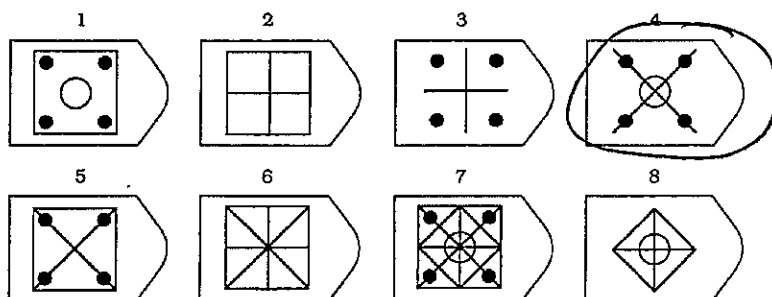
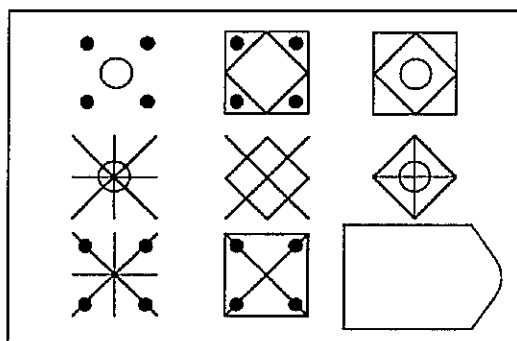
PATTERN 1



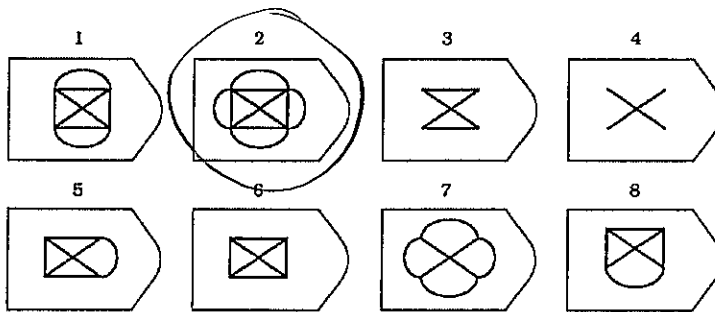
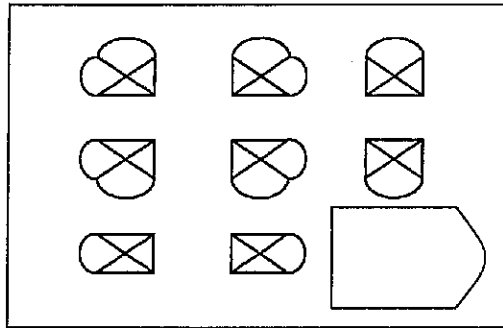
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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PLEASE CONTINUE ON NEXT PAGE

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-

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2. Catching a cold is like...

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- ☒ C. Getting the flu. They are similar because they are both caused by not washing your hands.
- ☒ D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48823

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42837704

GROUP: Y

Version A

Alan

59
M.C.

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- D
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature?

- A
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- B
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A= erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A= dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- C
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
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5. Which of the following would cause the acidity of Earth's oceans to decrease?

- C
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- C
- a. Reservoir A has a shorter residence time than Reservoir B.
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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B.
a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.

↓
100
50

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- B.
a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
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it's
B

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- D.
a. The Earth's atmosphere would become colder than it is today.
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I was in the study

office hours today

room 117

SHORT ANSWER. 25 points each (50 points total)

overall decrease slower rate

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

25

CO₂
CO₂
An increase in atmospheric CO₂ would increase (put more CO₂ into the ocean (dissolution). With more CO₂ in the ocean, the pH increases. However there is an imbalance trend, since the Atmosphere has more CO₂, its temperature increases, making the atmosphere warmer, and that would make the ocean water warmer too. The warmer the water, the less CO₂ it gets from the atmosphere. So the oceans CO₂ levels are decreasing a little because warm water is not that good at absorbing the CO₂, but Overall, the CO₂ is increasing in the ocean but in a slower rate.

negative feedback = the increase of CO₂ in the atmosphere makes the oceans CO₂ increase as well. However, the increase in CO₂ in atmosphere makes the atmosphere warmer, making water warmer, and warm water absorbs less CO₂ from atmosphere than cold water.

positive feedback = Atmospheric CO₂ makes the atmosphere temperature increase. This causes the ocean water to evaporate and form more clouds. Therefore, more energy will be released during cloud formation and temperature will go ~~down~~ up.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

22

greenhouse effect is the natural effect of heat (mostly infrared) being trapped in the atmosphere. The visible energy from sun hitting surface of earth, making it absorbing and re-emitted into Infrared energy heat. The some of the Infrared is absorbed and re-emitted by the greenhouse gases into all directions. This undergoes and repeats eventually trapping the IR.

Volcanoes fill Atmosphere with ash, blocking alot of visible energy from the sun. However, although its preventing the process of IR heat being trapped and preventing visible energy from the sun to enter, the ashes cause the atmosphere to heat up, because of too much CO₂. The atmosphere gets very warm, causing the ocean to get warm, absorbing less CO₂ from the atmosphere. Then when it starts to clear, visible energy passes through and IR energy heat gets trapped with the ghs that the ashes caused making the Atmosphere still be warm.

2 Extra credit (2 points)

How are evaporation and degassing similar and/or different?

liquid to gas

gas in a liquid moving

Change Phase → doesn't change phase
They both end up as a gas however, evaporation

Earn up to 1 additional point on your course grade

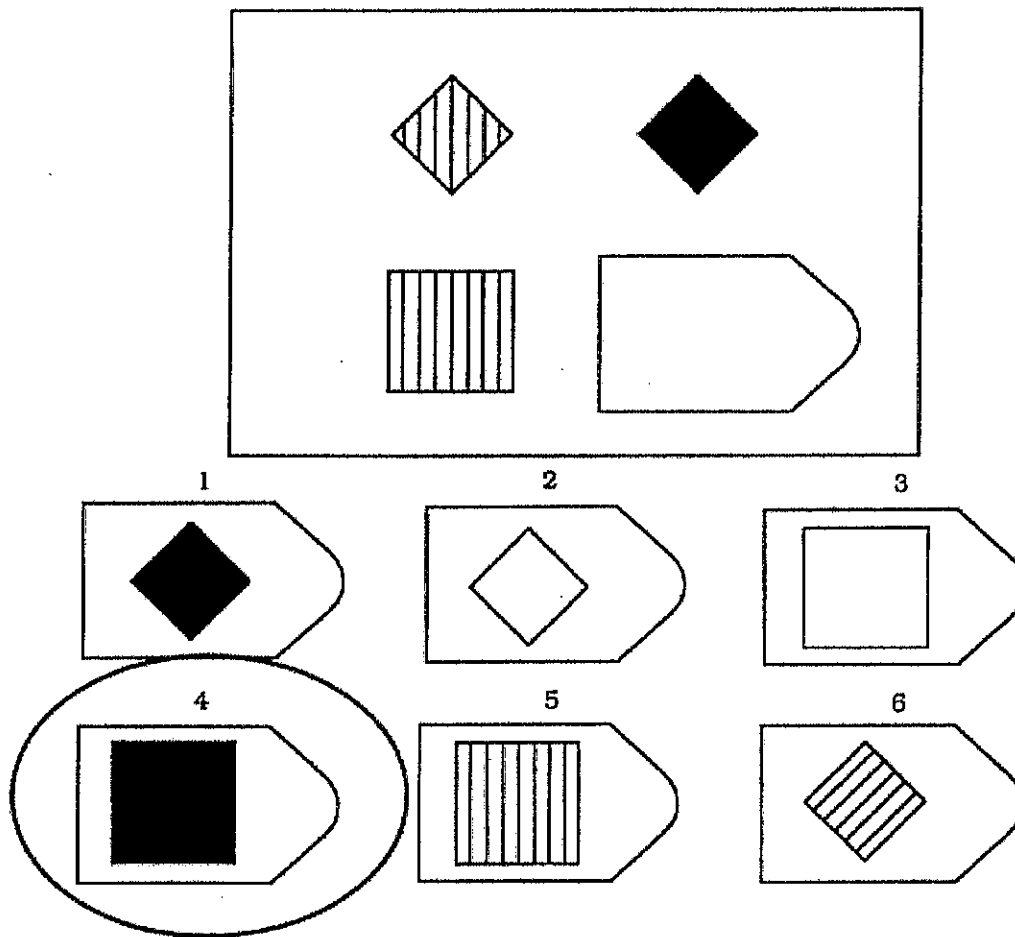
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

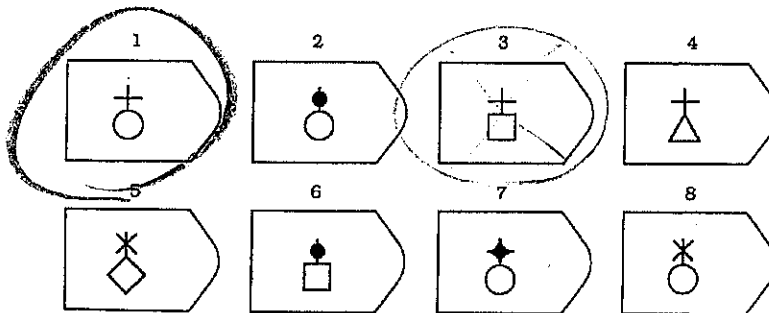
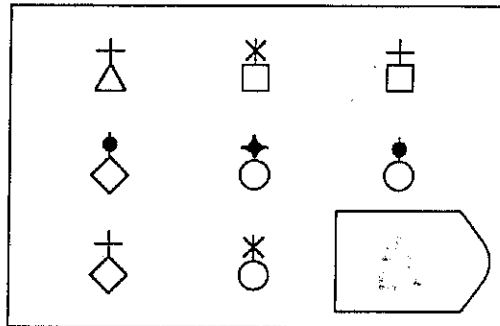


Answer: 4

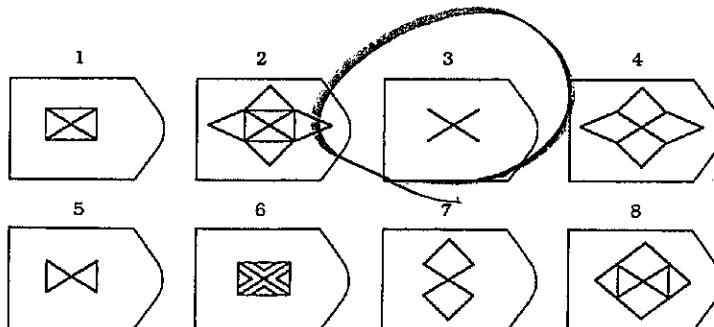
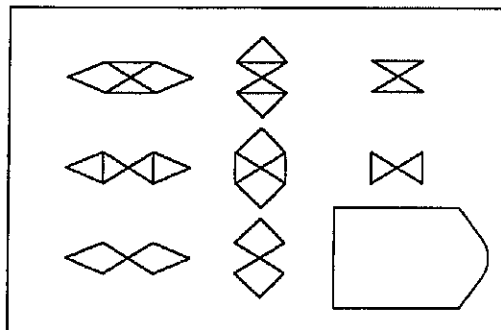
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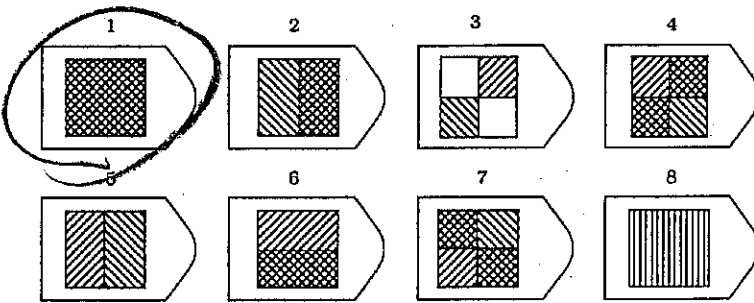
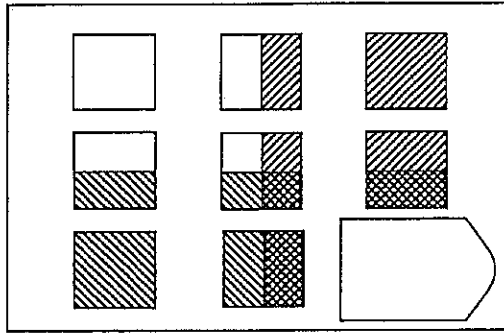
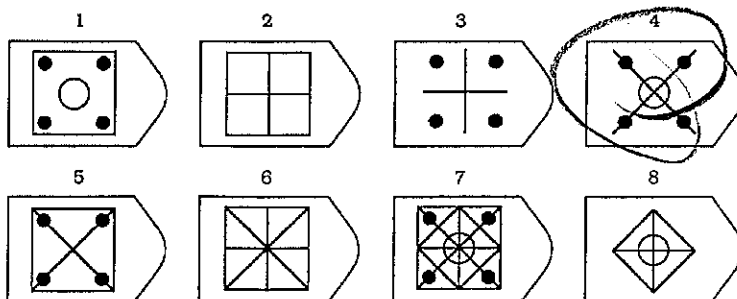
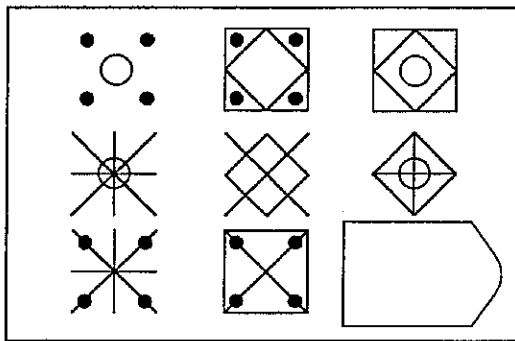
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PATTERN 1

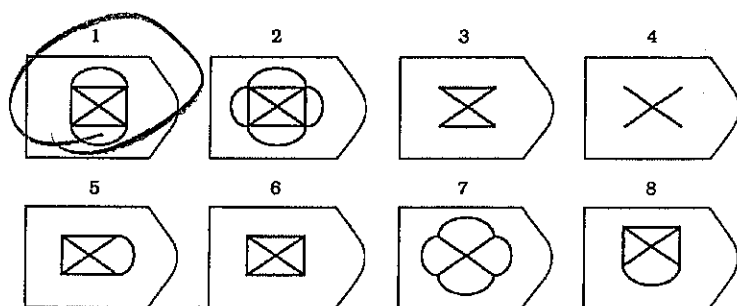
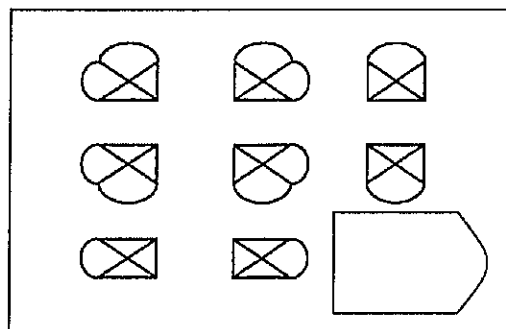


PATTERN 2



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

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- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

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- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
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- C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
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PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - ☒ B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48226

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☐ Caucasian
- ☒ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A37417357
Version A

GROUP: Y

MULTIPLE-CHOICE. 5 points each (50 points total).

16

- ☒ C 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface? C
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ☒ c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- ☒ B 2. Which of the following would be considered a negative feedback to increasing global temperature? B
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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- ☒ B 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
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- ☒ a. Human activities are the primary cause of the greenhouse effect.
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 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
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- ☒ C 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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- ☒ C 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - ☒ c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- | | | |
|---|-----|-----|
| 1 | 100 | 50 |
| 2 | 150 | 100 |
| 3 | 200 | 150 |
| 4 | 250 | 200 |
| 5 | | |
| 6 | | |
| 7 | | |
- a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

The more CO_2 that is combined with H_2O the more acid is developed ^{ca} leaving H^+ to be left causing more gas. As CO_2 continues to increase in oceans it makes it harder for the oceans to get rid of acidification causing harm to animals and other wildlife in the oceans which then harms the people that eat the wildlife. This also kills off anything bad so it helps wildlife.

10

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

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Atmosphere

The ashes cause chemical break downs in the atmospheres making holes in the ozone that cause rays of sun to continue to break down layers making it more hotter on earth raising the temp. By the ash coming out it causes a new barrier to be created trapping heat in. Thus forming greenhouse effect.

~~1~~ 1

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

The both are releasing gasses into the atmosphere and soaking up remains

I did like 95% of my classwork but no grade had be reported on angel.

Earn up to 1 additional point on your course grade

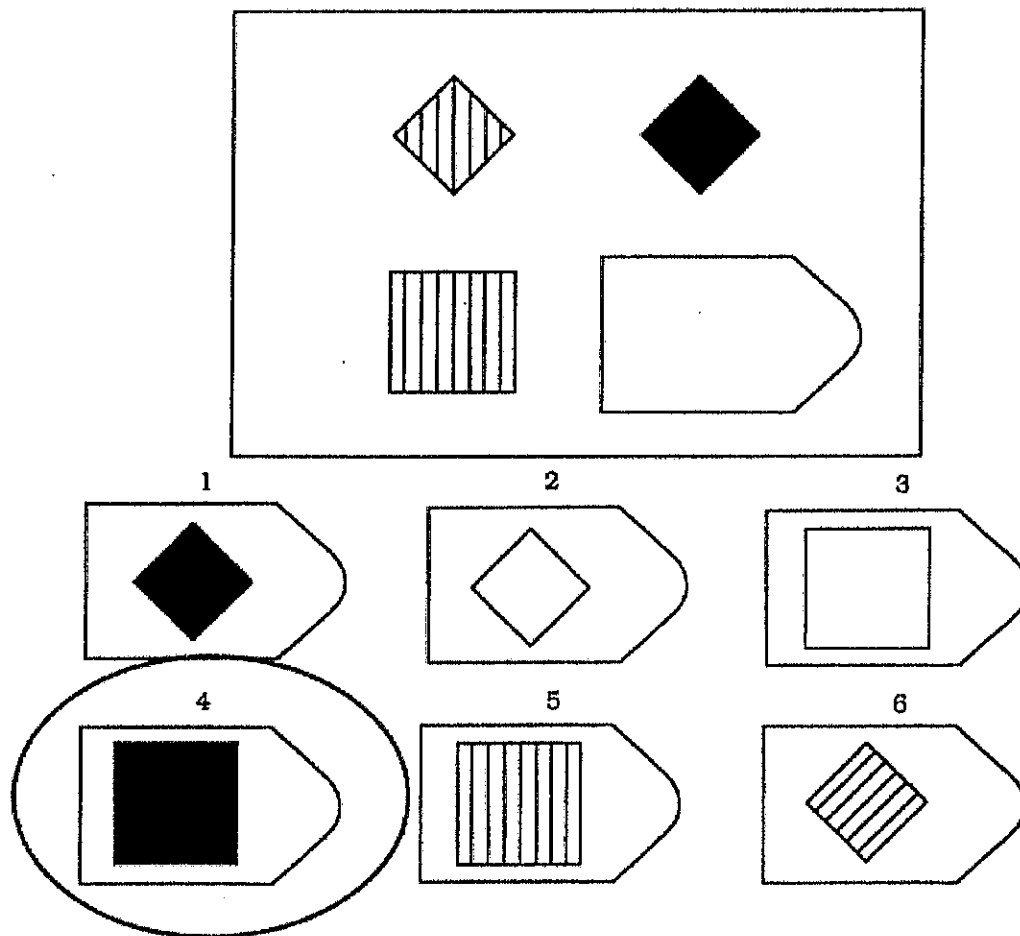
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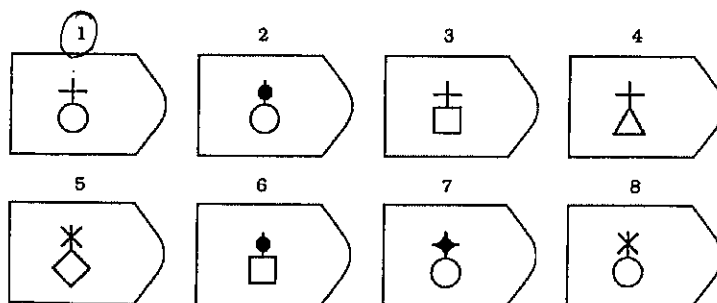
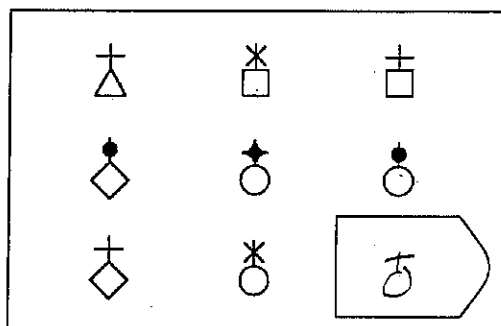


Answer: 4

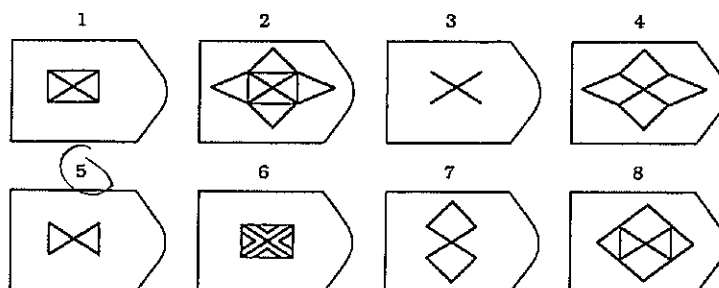
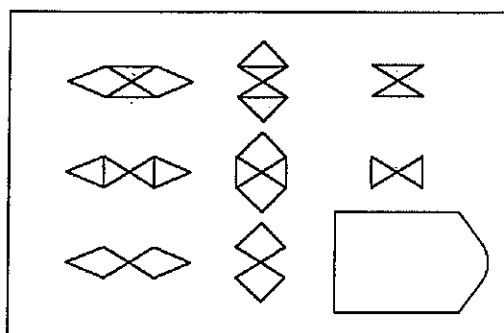
PLEASE CONTINUE ON NEXT PAGE

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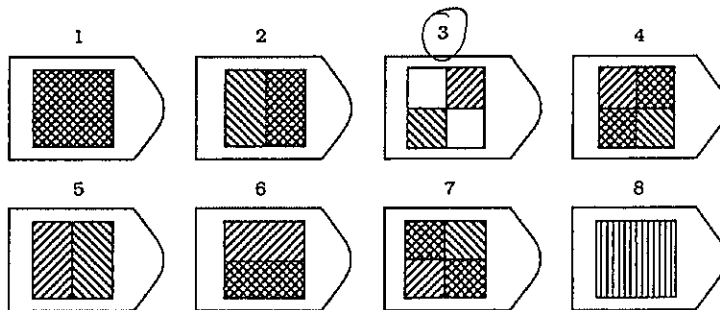
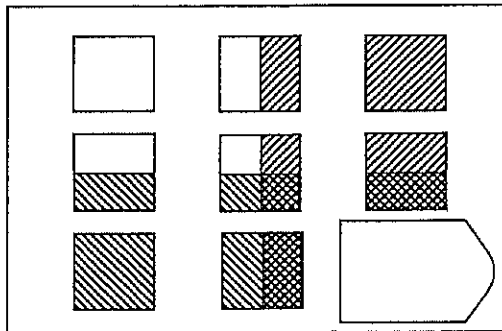
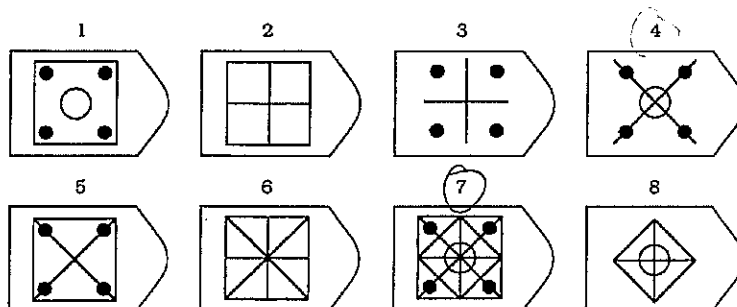
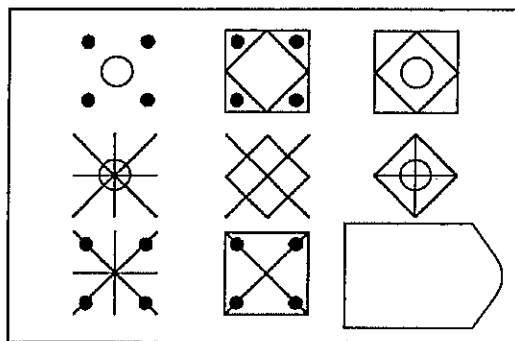
PATTERN 1



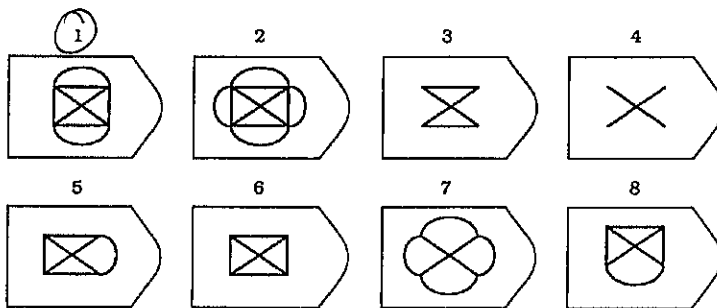
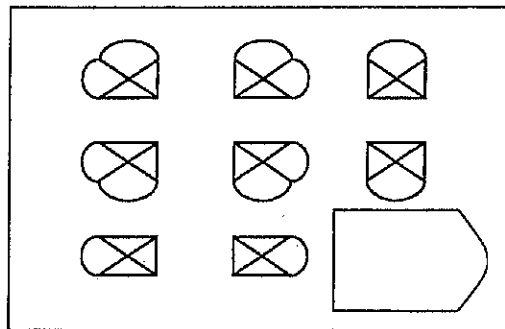
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

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PLEASE CONTINUE ON NEXT PAGE

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PLEASE CONTINUE ON NEXT PAGE

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- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- ☒ D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 23 years

What is your home zip code? 48840

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☒ Native American
- ☐ Other

STUDENT NAME: A42177911
Version A

GROUP: Y

82

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
- ~~a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed - increase~~
 - ~~b. Melting of permafrost resulting in more methane escaping into the atmosphere - increase~~
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat - decrease
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ~~a. A= erosion, B= deposition, C= uplift and erosion~~
 - ~~b. A = erosion, B= biochemical precipitation, C= uplift and deposition~~
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ~~c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.~~
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☐ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$ 25
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

a. Ocean acidification occurs when carbon dioxide mixes with water to form bicarbonate and hydrogen ions, as shown in the formula above. These hydrogen ions produce the acidity that is held within the oceans. Therefore, the more CO_2 in the ocean, the more hydrogen ions, the more acidic the water becomes. However, if the temperature increases it decreases its ability to hold CO_2 and therefore decreases ocean acidification.

b. A negative feedback example for ocean acidification is the increase in atmospheric temperature, which then decreases the amount of CO_2 in the atmosphere. The amount of CO_2 in the oceans is then also decreased, decreasing the amount of acidity in the oceans, which then decreases atmospheric temperatures.

A positive feedback example for ocean acidification is the decrease in atmospheric temperature, which then increases the amount of CO_2 in the atmosphere. The amount of CO_2 in the oceans is then also increased, increasing the hydrogen ions and oceanic acidity.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a. The increase of volcanism will help to decrease the atmospheric temperature by blocking solar radiation that causes the greenhouse effect. During the greenhouse effect the sun's visible energy wavelengths are small enough to enter the Earth's atmosphere. Once entered, the energy is either absorbed, reflected or lost into space. If reflected, the atmospheric temperature will not rise, ~~it~~ lost in space there will be no change in atmospheric temperature. However, once absorbed the energy is then converted to infrared energy which can then be absorbed, reflected or re-emitted, because greenhouse gases are good absorbers the "trapped" infrared heat continues warming the Earth.

b. Volcanism will erupt large clouds of ash. This ash then blocks the solar radiation which begins the process of the greenhouse effect. If the energy is blocked there will be a decrease in atmospheric temperature, as the energy will not have an opportunity to be reflected and converted

25

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

ok evaporation - the movement of a liquid to a gas

degassing - the movement of liquid gas to atmospheric gas

Earn up to 1 additional point on your course grade

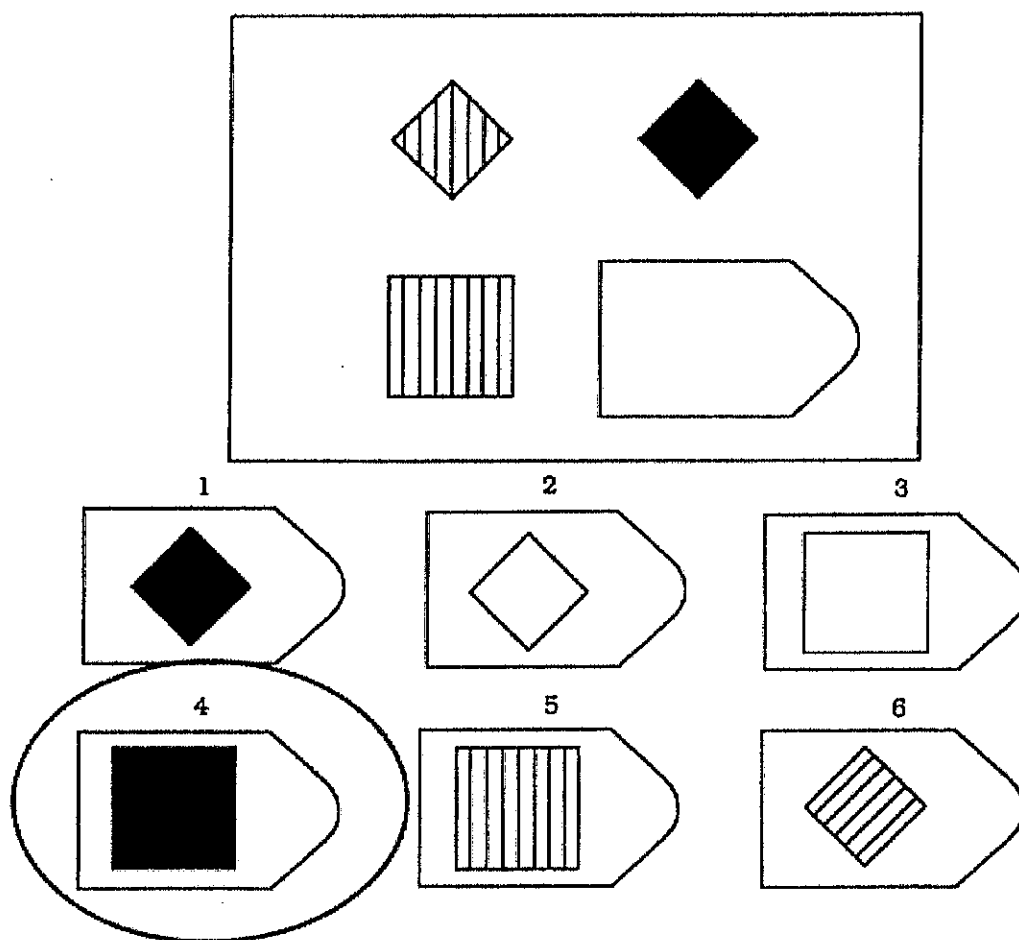
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

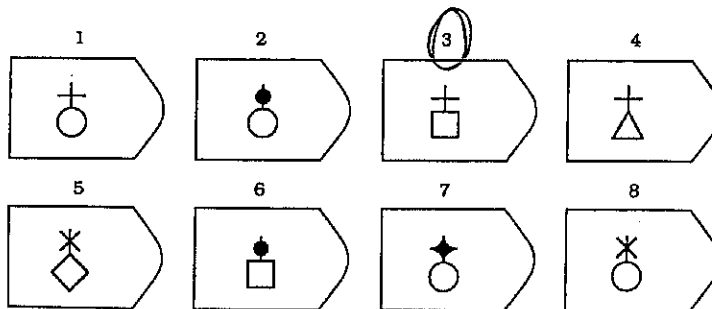
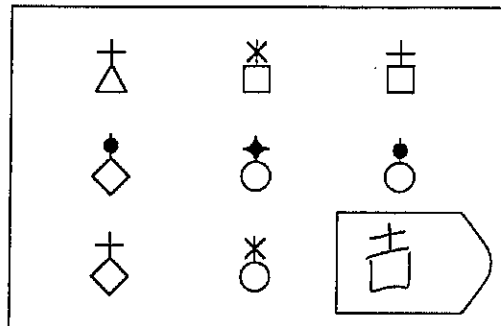


Answer: 4

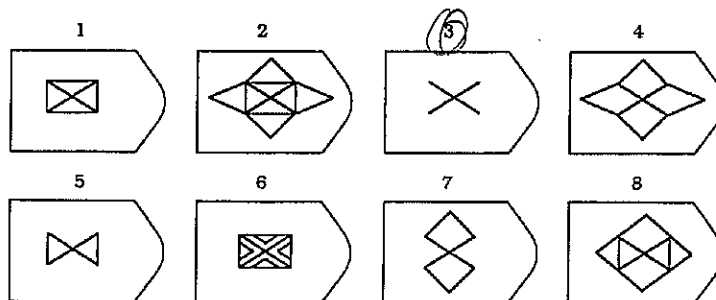
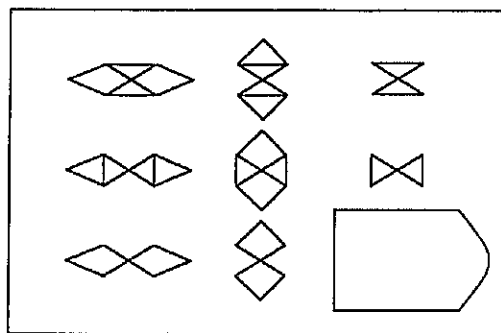
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

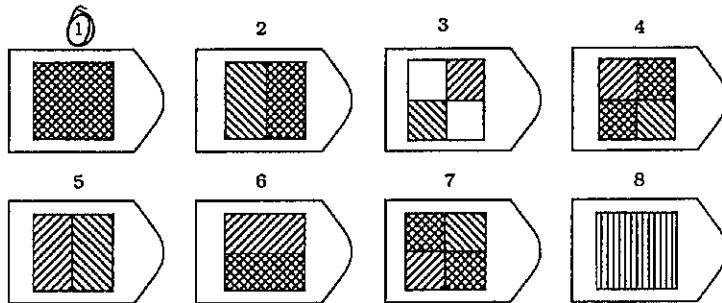
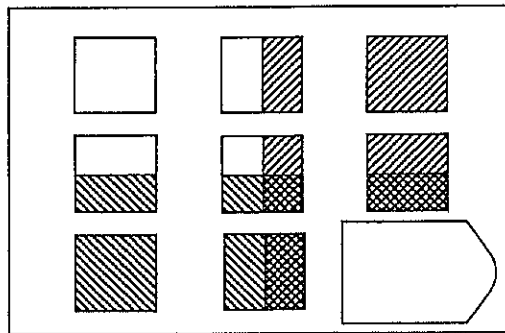
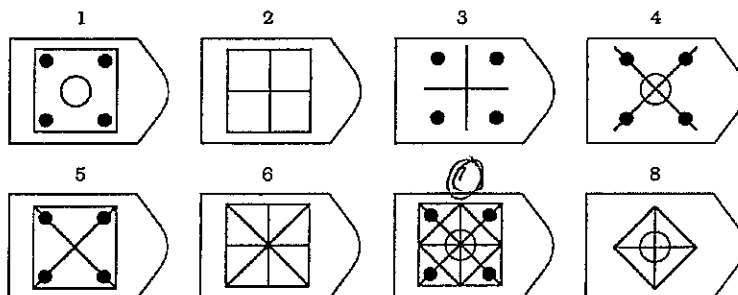
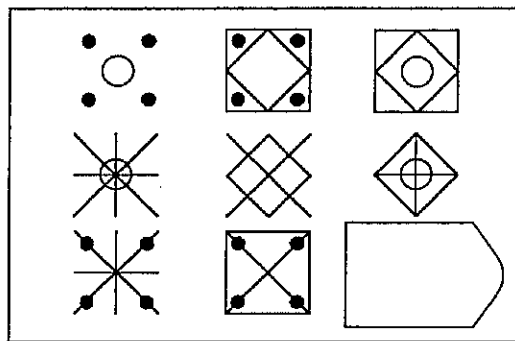
PATTERN 1



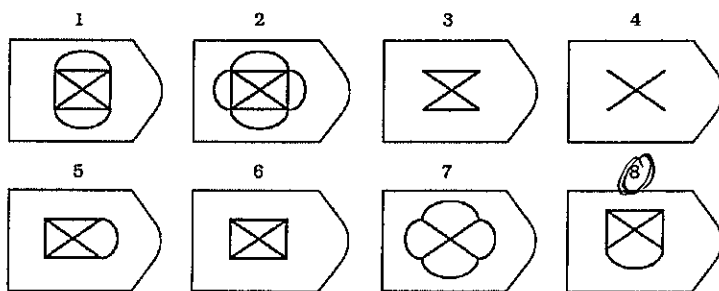
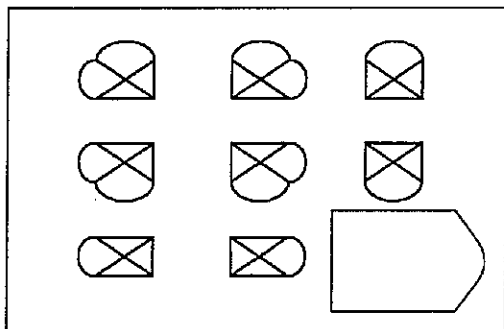
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- ☒ C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - ☒ C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

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 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 49445

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☐ Caucasian

☒ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other